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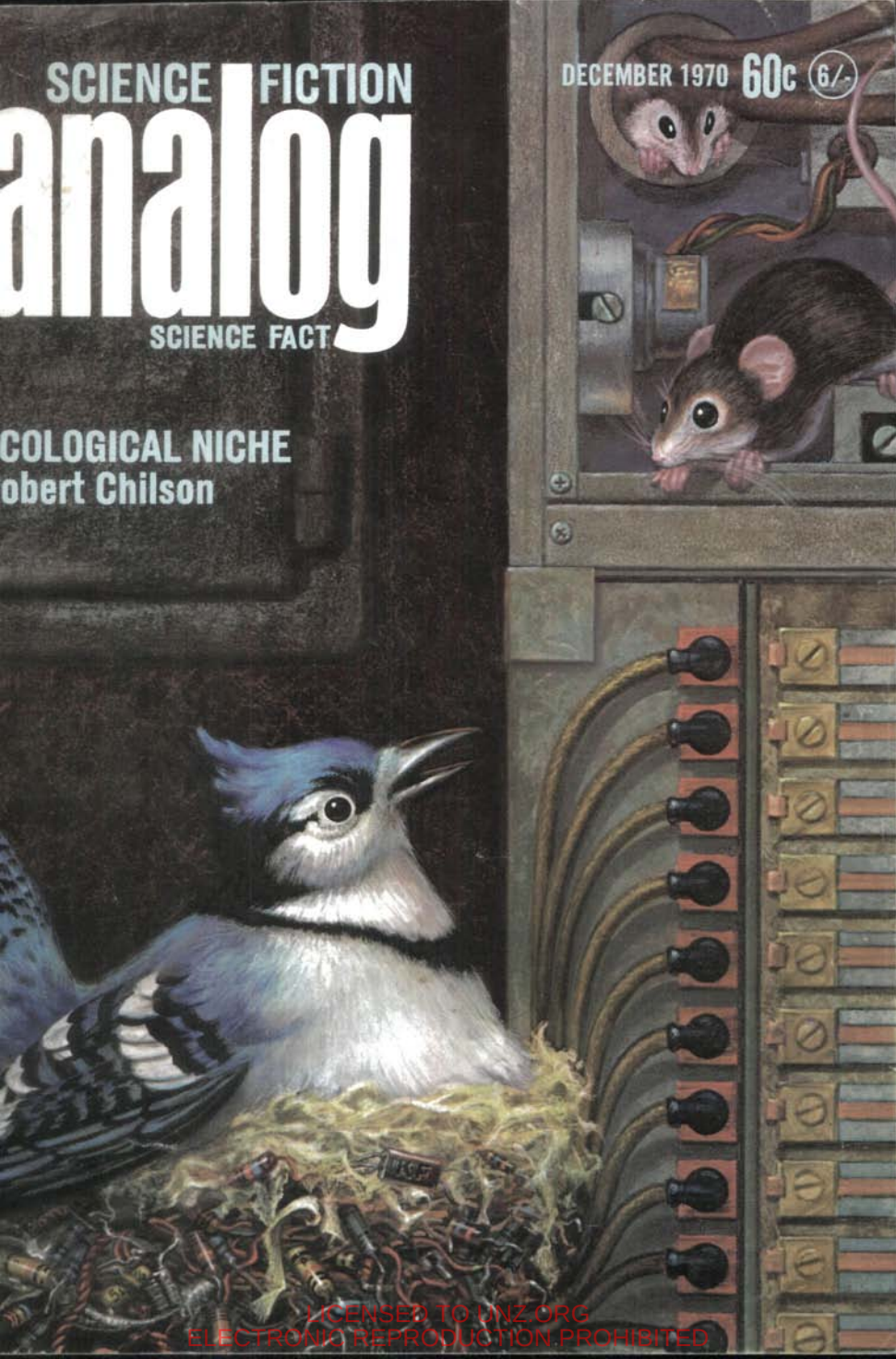

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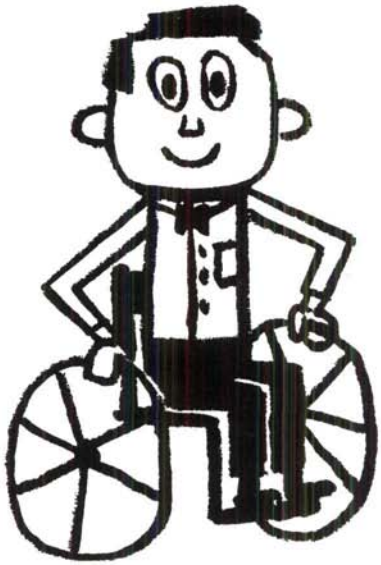

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the modern black arts

Editorial by John W. Campbell

A few months ago I received an angry letter from a professor of psychology assuring me that my editorials revealed clearly that I had no understanding of even the basic elements of modern psychology and sociology.

The essence of my answer was that I agreed with him; I didn't—and I didn't understand the basic elements of the science of Alchemy, the use of the Philosopher's stone, or The Great Science—Magic, either.

After several centuries of much effort by many learned thinkers, alchemists finally gave up trying to transmute gold by incantations, stopped trying to make astrology control the chemicals they worked with, invented Chemistry, and really got going. But Alchemy's basic elements: Earth, Air, Fire and Water didn't seem to play much part in the science that finally emerged.

A genuine scientist whom I respect—Hal Schwartzberg, of the RCA space research laboratories in Princeton, N.J.—gave me what I think is the clearest, simplest, and most useful definition of a true *science* that I've encountered. Since Schwartzberg was one of those responsible for the development of the cameras on the Lunar Orbiter that sent back those magnificent pictures of the Moon, he *knows* science, because he uses it and makes it work. His definition is, simply: "The measure of the rigor of a Science is the index of its ability to predict."

A lot of people get snookered on that one; if a self-proclaimed science can "explain" what happened after it happened with a smooth, logical-sounding explanation, it tends to seem like a real science. "Why, that wasn't surprising; after all we know that . . ." and a fine, coherent explanation rolls out.

That's not science; that's a con game.

You have a science when the scientist can say what *will* happen, not

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merely "explain" what did happen. The measure of the rigor of the science, as Schwartzberg says, is the measure of the accuracy of its predictions.

Notice that Astrology was a true, accurate science, in the department of predicting the movements of the heavenly bodies. The ancient astrologers could predict eclipses, the future appearances of the Morning Stars and the Evening Stars, the conjunctions and retrograde movements of the planets with accuracy. Sure—they sort of went overboard in trying to fill the demand for predictions about human affairs, but that howling demand was the result of their proven ability to predict stellar movements.

Psychology and sociology today are definitely not sciences; they're con games. Their index of predictability is, if carefully studied, negative. I.e., what they predict is quite frequently the negative of what actually happens.

The psychologists have Theories—as did the Alchemists of old—and Logical Conclusions from these theories. And the Theories do not in fact match the realities in the field—with the result that the predictions come out wrong.

I don't know who first said it—it's been attributed to many respected possessors of hard-headed sense, such as Mark Twain, Will Rogers, Abe Lincoln and P.T. Barnum—but I suspect the *first* one to say it was Ugh, the Caveman, in his later years. But the comment applies down through the millennia: "It ain't what you don't know that hurts you most; it's all them things you do know that ain't so."

It's all them things psychologists and sociologists do know that ain't so that's preventing any appreciable progress in these critical, and terribly needed areas.

How do I know they're so wrong? When I've never even studied the subjects?!

Easily; I need only apply the Schwartzberg Test to determine whether or not they know what they're talking about. Since they flunk that test with marks between 0.0 and −0.2, I can know they're wrong, without knowing anything about what their theories are, or what the right answers are. After all, if you watch somebody cleaning the pots and he cracks more than he gets clean—you can conclude that his pot-cleaning technique is not valid.

And as of now, the world can not afford alchemists, when we so desperately need competent chemists. We can't afford schools of psychology and sociology that are so incompetent, when the world has such highly functional nuclear, chemical and biological sciences—

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and no functional sociology or psychology.

The one area of psychology that has a definite positive index of predictability is the area that's been hammered into shape by the hard-headed, intellectually iconoclastic pragmatists of Madison Avenue. They hired psychologists to work out means of predicting how populations would react to motivational stimuli. The men with the money—in large quantities for results, and *only* for results; they had no other criterion!—wanted methods that worked. They were strictly Philistines with no respect for the beauty of Theories, the validity of Logic or anything else—only for pragmatic results.

The result was a development of a science of sales psychology that's moderately rigorous. It can be done when they are driven to it.

Any psychologists who couldn't put up with the hard-headed pragmatic demands of the Madison Avenue people with the large, attractive checks, was perfectly free to go back to the sheltered halls of Academe—and their meager checks.

There are always a few iconoclasts who come along as young upstarts trying to upset the Well Known and Thoroughly Recognized Basics—but they are usually suppressed fairly quickly by the united reactions of their academic superiors. Occasionally one does manage to break through and cause a disaster in some unexpected way—such as getting such widespread public interest that his experimental evidence *has* to be looked at. Young Jim McConnell a few years back, cracked the barriers and forced Psychology to acknowledge that practically brainless organisms, such as the *planaria* flatworms, could be taught. And even worse, that learning evidently lodged at a cellular level!

But he did that by devising an experiment so cheap and simple that thousands of high-school science students could, and did duplicate it and thereby showed that McConnell's statement had a high index of predictability—i.e., things happened as he said they would.

Generally speaking, any field with Well Established Fundamentals and Basic Elements is exceedingly hard to change. They know so many things that are so deeply ingrained, they simply won't seriously consider that they could be wrong.

Obviously, in psychology and sociology—that is, obvious to anyone but a psychologist or sociologist—the theories and Well Known Fundamentals *are* wrong.

Proof: Neither "science" comes close to passing the Schwartzberg Test.

Until they can, they aren't sciences—and in view of the amount of money now being sunk into their recommendations, I say they're con games.

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Item: The percentage of successful therapeutic treatment by psychiatrists in New York State, *according to their own studies,* is slightly *lower* than the "spontaneous recovery rate" for similar cases.

Item: The rate of recovery of psychiatric patients treated by a Guatemalan Indian witch doctor is about 10% higher than that of the average New York City $50-an-hour psychiatrist.

Conclusion: Both therapists have Theories in which they believe deeply and sincerely, and on which they base their therapies. But on the Schwartzberg Test, the Guatamalan witch doctor's theories—while obviously still inadequate—are considerably more valid than those of the New York City psychiatrist. They must be; they work better.

Item: The essence of Psychology is to understand the human mind, how it works, how it handles sensory data, how it manipulates concepts, and what motivates human beings. That's the assignment that Society as a whole needs fulfilled—and that any man who claims to be a "scientific psychologist" claims he can fill.

He can't. He can't explain how to communicate with a man who has a false world picture so that man can realign his evaluations. He can't aid two men, with differing world pictures, to integrate their understandings and agreement.

If he could, he'd be able to do something to help the present violent tensions between many college students and the rest of Society—which they call "The Establishment," the term having the value of a dirty curse in their semantics.

When communication and understanding are blocked by inability to communicate, the usual frustration-release tendency is a motivation toward violence. "He refuses to accept the importance of my data and react to it as I know he should: I'll *make* him realize it's *important!*"

The problem there is, simply to induce a reevaluation of importances on both sides to find a truth which improves the situation to optimum—and to make both sides appreciate that there is, was, and will never be a Perfect Solution. Only an Optimum.

And that, clearly, calls for the development of fundamental understandings of the mind—and not the "Earth, Air, Fire and Water" class of "elements" that psychology now insists on.

One of the great problems of the backward nations today is the depressing problem of getting the people to eat a decent diet. The traditional diet of these peoples tends to be one with plenty of calories, lots of carbohydrates and a fair amount of vegetable fats—but

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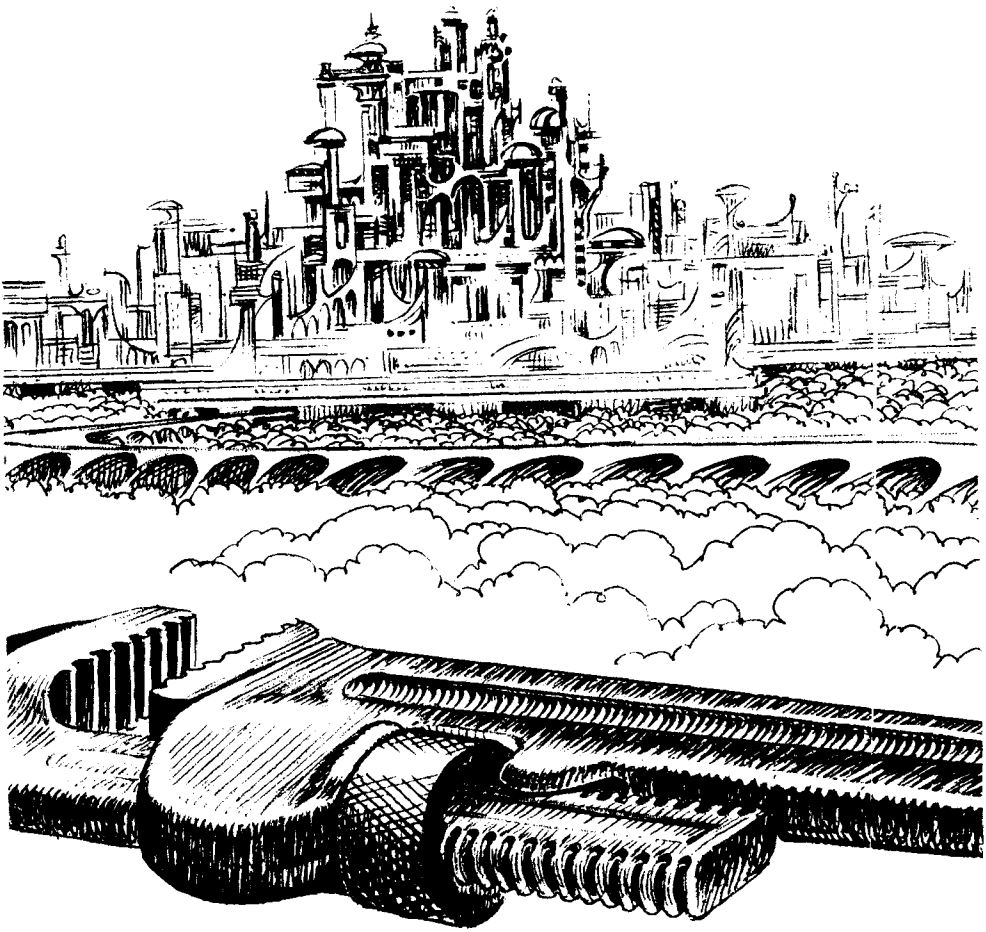

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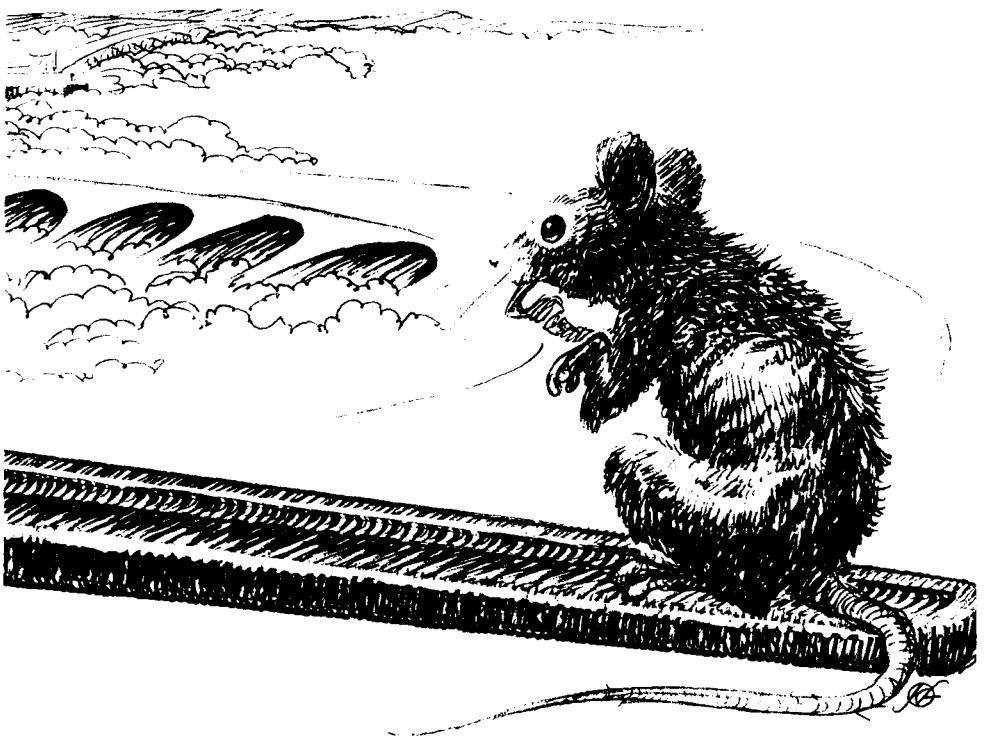
ecological niche

The Designers forgot to design an ecology into their city—but that was all right. They got it anyway!

ROBERT CHILSON
Illustrated by Kelly Freas



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Charlie Sweeney whistled happily as he approached the ventilator intake. His City Service uniform and Maintenance badge had been enough to get him in, this time. Usually when things went wrong in an office block, they screamed for repairs, then made you wait while they wasted the super's time by calling up and verifying your credentials. And here, they didn't even know there was anything wrong. Computer spot-checking had revealed that air intake here was down. But they passed him with a smile. Nice to know when you're appreciated.

The screened intake was a little way up the usual cluttered service corridor behind its locked "Restricted" door. He almost hadn't seen the door, concealed by interior decorators. This service corridor was short, seven or eight feet, and crammed with assorted equipment it might be a good idea to give a once-over after he finished with the intake. He felt the place hadn't been entered in years.

Charlie frowned at the vent. The finely screened grille was an old one, probably installed when the city was built. The actual grille looked O.K., it was one of the dozens of steel-tough plastics—pale gold for intake. But the ring it was clipped into was a beautiful soft red-brown called steel-brown—it was made of self-sealing steel alloy. Trouble with that was it eroded away too easily—here, where the plastic grille had vibrated for decades, the tough oxide coating had been worn off, then reformed, until the ring was worn away in ripples all around the grille. He could almost stick his little finger behind it at spots.

Gotta see about puttin' in a new foral clip ring, he thought, producing a screwdriver-like clip key. The grille was secured by three screw-like clips which only the key could open. Funny—the vent fan here wasn't spinning, but he heard a hum from within. It swelled and faded rapidly and erratically, falling silent for many seconds at a time. Vibration carried along the duct? But it didn't sound like any vibe he'd ever heard, and nobody in the city unit, except some of the really smart ones, knew more about machines than Charlie.

The click of the upper clip seemed to start it up, but it faded even as he cocked his ear. The same with the second one. The only thing he could think of was that the relay that activated the vent fan was erratic, and vibration kicked it over. But starting and stopping the fan shouldn't sound like that. Sometimes it sounded like there were half a dozen little fans in there. Just what kind of installation was this?

He yanked the grille off and dropped it with a dull *clunk*, peering past the fan immediately behind it. The hum swelled to fill the cluttered service corridor, breaking

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on a note of rage at the flood of light. Charlie screamed and jerked back, flinging both hands up to protect his face. The clip key went flying and he staggered away, turning and tripping and banging into things in the corridor. With a final burst of screaming he erupted into Organic Refining Company's crowded outer office, jumping and slapping and fanning the air around him.

"Sir, the nearest zoologist to Sheldon Forks is a Dr. Flanders. He works for Missouri Public Service and is in the immediate area right now. I have his address. They're perfectly willing to loan him to us for a week at no charge if we pay room and board."

The hardness of Reade Stennis's expression was an indicator of the toughness of the problem he faced, and at the moment it might have been carved from a hunk of particularly obstinate obsidian.

"What does a power company want with a zoologist?" he asked cautiously.

"MPS not only sells us a third of our power, but half our food," Michaels told him. "They're one of the biggest farm companies in the state."

"O.K., we'll take him. Flanders, is it? Let's hope he's better than that nit from KayCee. Call him up."

Michaels looked as if he were about to cry.

Three hours later he pulled over and peered uncertainly at a cryptic road sign designating an empty but obviously well-used side road. It was an odd experience not to be able to call up a man; even farm workers were usually reachable, and this was a Doctor of Zoology! However, he, Michaels, was chief of the Department of Maintenance's Liaison Office. "Go contact him," Stennis had said.

Michaels sighed.

A hundred years before, this side road had been unpaved, a gravel farm-access road. The one he was turning off of had probably been impermanently paved. Now both were paved, the feeder with polycrete, the access road with a pavement composition; hard, rubbery stuff poured on over the bed and microgrooved. With a shrug he pulled out onto it, finding it was quieter than the hard pavement. It seemed odd to be driving between lines of trees. They blocked his view of the fields and even ahead, as the road wasn't straight. But there was no traffic.

Several miles down, he spotted a car parked at a gate that made a gap in the row of trees along the fence. Presumably that was it. He parked the little nuclear-electric, glanced interestedly at the zoologist's much bigger machine, and opened the monster gate a crack to slip through.

The access and feeder roads made a rough checkerboard of rec-

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tangles as much as four by six miles, though the average was less. In the old days, though Michaels was only vaguely aware of it, the rectangles were divided up into a dozen or more farms each. The big farming companies had bought them all up and bulldozed out all houses, trees, and fences, then sent in earthmoving equipment to terrace the land according to the Karch system: HILE or Hydrosol Intransitive Land Engineering. The gentle terraces prevented all runoff, eliminating both erosion and drying up of the water table—effectively doubling an area's precipitation. (Eliminating runoff alone cut road maintenance by two-thirds.) The Karch system and the elimination of moldboard and other turning plows, and of plowing under cover crops and fertilizer, doubled the carrying capacity of the land. Modern production technology helped, too.

But even in the mid Twenty-first Century, children cut their teeth on Old MacDonald and the Nineteenth Century laden-Ark farm with every kind of domesticated animal and bird known, raising every kind of crop, including fruit. More specific information never corrected the early impressions—school merely touched on it and fiction found the old-style farm more congenial. Thus the field Michaels found himself in was stranger to him than the surface of Mars.

It sloped gently away from him in bright green billows like the smoothest of swells, very long ones. Miles away it climbed as gently back up to the far fencerow. In the center, where one would expect to see a creek, was nothing. The field was not furrowed; no ground was visible. Instead, plant tops like green foam intertangled as thickly as fur all over it, with an occasional weed towering above. Michaels stooped and peered, finding that green fountains of tops projected from the soil every two inches; only a third of them were very big.

Half a mile or more out in the field, and a good three-quarters of a mile from him, his olive-drab working dress a blot on the bright green, was a man, presumably Dr. Flanders. Michaels hesitated, hating to tread on the crop. But it was not possible to cross the field without stepping on plants. He set out, picking his way gingerly through the ankle-deep foam.

A third of the way out he realized that those pictures of farmers in straw hats were not just quaint cuteness: the sun slammed down on his head. Then he had another experience: Dr. Flanders straightened up, saw him, nodded and half-waved in acknowledgment, then bent over again.

Michaels felt foolish. He'd never had the experience of seeing someone he could not immediately speak

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to. He forged on, sweating, and finally reached the cool-seeming zoologist.

"What can I do for you?" Dr. Flanders asked pleasantly. He held a clipboard and wore an electroniscope around his neck.

Michaels handed him the City's personnel-requisition agreement with MPS's endorsement. The zoologist's eyebrows shot up. "What's this? Trouble in the zoo, or do you need advice on your Green Belt?"

"Not exactly," said Michaels unhappily. "Uh . . . Maintenance Department requested your aid. I'm to take you straight to the Chief."

Flanders pursed his mouth in surprise. "Maintenance," he said. Looking at Michaels, he asked, "What is it, birds blocking the air intakes? Kansas City solved that problem several years ago."

"It's not that . . . uh . . . not exactly," said Michaels miserably. "Uh . . . if you'll come, Mr. Stennis will explain. It's a bit—complex."

Flanders puzzled over it for a few more moments, came to a decision. "This agreement takes effect immediately," he observed, folding his clipboard, "and, while I hate to interrupt a survey, I'm curious. Just what the devil can an advanced arcological unit like the Forks want with a zoologist?"

Michaels kept grimly quiet while the scientist filled a page with observations and filled out a printed form. On the way back to the big gate, he asked, "Just what were you doing out here? You're not an agriculturist, or whatever the word is, are you?"

"Agronomist. No. I don't even specialize in animal husbandry—raising domesticated animals. I'm presently conducting a survey of birds versus insect damage. You may have noticed the heavy fencerows around the fields here."

"The trees? Yes. Don't they get all the good out of the soil?"

"They do sap it to an extent. But their roots don't reach a fraction of a field this size. More important, they provide homes and food for thousands of birds—we plant assorted wild, hardy fruit trees, requiring no care and producing nothing commercially valuable. I go down a fencerow, counting all the birds of all kinds, including nests; then I go through the field, counting all bugs I see of all types—in selected meter-square samples, see? The more birds in the trees, the fewer bugs in the field. Specific enzyme sprays only knock out specific bugs; panlethal insecticides are dangerous and consequently restricted. But birds have no side effects."

"Don't they eat the crops, too?"

"Some they bother quite a bit. This field is in carrots; they don't bother them much. But their damage is minor beside insect damage."

A rabbit erupted from under their feet and sprinted desperately for the fencerow. Michaels jumped

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and stumbled, crushing carrot tops.

"How about rabbits and other things that live in those fencerows, too?" he demanded, partly to cover his blunderings.

Flanders was phlegmatic. "This field is miles across and provides absolutely no cover. Look there."

A *big* bird with a red tail drifted silently, slantwise, across the field.

"Hawk," said the zoologist complacently. "And at night, when rabbits are most active, the owls are out—and owls are first-degree murder even beside hawks. It evens out. The plants can always grow new tops, unless they've just sprouted, anyway. It just stunts their growth. Most of the carrots have to be stunted anyway, so the rest can grow. Size doesn't matter except for the tiny amount actually sold raw—that percentage declines every year with all vegetables."

"You plant them thick so you don't have to cultivate them, right?" Michaels looked over the field, still awed by its size—it covered almost as much ground as the city-unit of Sheldon Forks! He had seen the miles of such fields between Kansas City and the Forks from the Skyway many times, but from six hundred feet up and at ten miles a minute, they didn't look so big.

Flanders left his Company car and notes at one of the farm apartment buildings, picking up a small suitcase. As a senior specialist, his company kept moving him around and a sudden change of quarters was nothing to him.

Truck and car traffic swelled as they neared the city, and finally the feeders put them on the limited-access highway that circled the city at a respectful distance, then swooped into it. This was a twin double-lane affair: two lanes each for cars and trucks each way. As they approached the mile-wide Green Belt Park around the unit, the outer car lanes split off from the truck lanes. Michaels pulled over.

Here the car entrance lanes turned and the land dropped away from beneath them as they crossed over the Green Belt on thick columns. A quarter of a mile farther on, the truck lanes turned and passed over the Green Belt; farther on, the return truck lanes came out. Beyond them again were the car exit lanes. When the Green Belt had been established around the city unit, it had been HILE-scaped and forested, great care being taken to return it to as near the natural state as possible. No buildings were allowed on it, and no powered vehicles except wheelchairs. Police Rangers patrolled on horseback and bike.

The city/park area totaled forty-nine square miles. The city unit itself was a square five miles on a side. It averaged a quarter mile tall for a total volume of over six cubic miles; population, one million. A small, stodgy manufacturing town,

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practically a company town as all independent arcologies were. A hundred big corporations had constructed it above a shared factory complex.

"Look at it," said Michaels bitterly, and Flanders looked. It was big, even seen from a mile away, but its size was not impressive to a Twenty-first Century man. This one was reasonably advanced, despite its age of over three decades, and it was integrated and administered with a degree of efficiency rarely seen. It was still unimpressive.

"Restricted access. Completely controlled, wouldn't you say? Hah!"

Startled, Flanders looked at the city again. When the concept of the arcology was developed, it was recognized that it would be necessary to restrict access, as on a limited-access highway, to make it a success. It was not solely a matter of efficiency, though that applied, but of growth. Unchecked growth is as bad in a city as in a man.

Thus, for this million-population city, one highway served—and it was only for local use. The Transcontinental Skyway ran north to Kansas City and south to Joplin at nearly a thousand kph. An elevated five-hundred-kph freight railway with a two-meter gauge—but still too narrow—ran northeast to a bustling little farm-center and road/rail junction that helped feed the city; the Intercity Skyway, same speed, linked to it, too. And on top of the unit were stages and decks for airbuses and private airboats. And that was it.

You could drive into the city toll-free—city tolls were unConstitutional—but the parking fees, even by the hour, were fantastic. Same with roofing an airboat. Parking of private Skyway railcars was equally high, though if you could afford one in the first place, you probably wouldn't notice it.

Limited access. But the real control was internal. Even with the most fantastic transport system, tearing down and renovating buildings inside the city unit was all but impossible. There were no more living quarters in it now than when it was built. Renovation and expansion of factories was not so difficult. Care was taken to maintain jobs enough for the whole population. When the arcology was designed, enough jobs to support one million people were designed in. When all cities were fully-integrated arcologies, unemployment perhaps would not be quite designed out of society, but they would come close.

Meantime, yes, real access was well-enough controlled by limiting growth.

Michaels followed his thoughts easily enough. "You haven't looked closely enough," he said wryly. "Look down there."

As they approached the city, Flanders looked. He saw doors, massive and ornate entrance-ways.

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Gates opening into the city's park every few hundred meters right around the city. And above were balconies, some with restaurants or ballrooms on them, others with restaurants and other public rooms behind them; some belonging to swank apartment blocks. Some were private, found in the swankiest apartment blocks of all. There were hanging gardens, roof gardens, domed public rooms and apartments on the roof—the city unit, above and all around, was an elaborate fretwork of openings to the outside.

He was a zoologist and the Green Belt was in the natural state.

"I see," he said. "But I don't see. I haven't spent much time in the Forks and I haven't looked your precautions over, but I know how fully-integrated arcologies are designed. Surely animals can only be a minor nuisance."

When he repeated his opinion to Reade Stennis, Director of City Maintenance, the other grunted, face pained.

"You've never heard of Charles Sweeney, then. Of course not. Nobody ever had until a few days ago. Sweeney's what we call a Junior Engineer, which is a fancy title equivalent to a highly-skilled specialist. He doesn't understand any fancy electronics, you understand, but can tear apart and fix any kind of electric motor, little or big. Never studied hydraulics, but can flush out and open pipes, fix pumps, the works. Knows nothing of the esoteric fluidic valves and switching we use in the air ducts, or anything much about pneumatics, but he can fix routing centers, mixers, filtration substations, and so on."

"An unspecialist, probably drawing as much pay as any specialist and worth twice it. I'm familiar with the type. Go on."

"Well, two days ago he opened an intake vent that wasn't taking in, and was attacked by bees. He's in hospital now with his head and forearms swollen out of shape and with a fever. Naturally we closed off the service corridor, and we sent off to Kansas City for a bee specialist. MoKan Food Factories loaned us an ape-ologist, or something from their Bee-Tree Honey Farm. He came down here with a special hit-suit and zap-spray, tailored to bees and instant-acting."

Stennis looked at him dourly. "He's in hospital beside Sweeney, not quite as bad off," he said succinctly. "When a company loans you a man, be sure you'll get the least valuable one they have. This ape-specialist was green, the hit-suit wasn't properly adjusted or something, and the zap-spray wasn't quite as fast-acting as he hoped. However," his dark features lightened a little, "it did kill them in a few hours. The corridor has been under surveillance since day before yesterday. My men stop by and

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look in from the door every few hours, and they say it's all quiet. One of them brought me this."

The director dug down in his desk and came out with a desk-ornament egg. It was an ovoid of plastic that polymerized as hard as glass, in which things could be sealed; about three by four centimeters. Flanders lifted it out of its base and turned it over, a grin breaking across his thin, leathery face.

Inside the egg was a small insect with cleancut lines, a delicately-molded yellow-striped black head, yellow-on-black thorax, and black-and-yellow striped abdomen. It was very much like a bee.

The zoologist's grin became a roar. "Two men in hospital," he whooped, "a specialist down from the city, the corridor under surveillance for two days and a half—for this!"

"What are they?" asked Stennis suddenly, squinting at him.

Flanders laughed again. "Yellow jackets! A kind of wasp, noted for the strength of its poison and also for its self-restraint. It takes pretty severe provocation to get one to sting. Bees are bigger, fatter, fuzzier, clumsier-looking, not as brightly marked, and not nearly as cleancut."

"Self-restraint!" said Stennis bitterly. "Two men laid up!"

"Provocation," Flanders told him with a faint grin. "Attacking the nest, that's provocation. Away from the nest, only an actual attack will force them to sting, like if one of them crawls up your sleeve and the fabric pulls tight against it. Sitting outdoors once with sweetened beverages, they swarmed around and lit on the rims of the glasses. We would just snap them off with a finger, and they would spin away in a perfect arc, catch themselves a couple of meters off, buzz, and fly away. Your apiarist's enzyme spray naturally was not fast-acting. It's a wonder it worked at all."

Reade Stennis looked glum. "I suppose it's funny enough. The next one will also amuse you." He glanced at a report. "A Miss Joy Carey, Senior Electrotech, head of a four-man team, took her team into a major service trunk yesterday." He looked at Flanders. "Few people know much about the service lines. These are corridors between building blocks through which water mains, sewage and garbage mains, power cables, telecom fiber cables, and trash-disposal chutes are routed. The lines themselves are major air ducts. Shorter corridors branch off, small air ducts, and so on, and they're broken up by filtration substations. Some are vertical, and all horizontals plug into the verticals."

Flanders was nodding.

"Well, you realize that they're extremely cluttered; that's why the rest of the city can look so neat. Also, the light is rather dim. It seems that Miss Carey heard a

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funny scurrying sound in a bundle of telecom cables, a bit like a sick mouse. She poked at the cable bundle with her toe, screamed, jumped about a meter high, and yanked down her pants."

The director looked hard at Flanders, detected the amused interest behind the impassive expression, and spoke deliberately. "You may know, Dr. Flanders, that Sheldon Forks is not a stickler for uniforms. If an employee wants to sew his or her insignia to a garment of approximately the correct color, we let it pass. City uniforms are *all* street clothing."

Flanders nodded. In the perfect climate of the city-unit, heavy outer clothing was unnecessary; street clothing was lightweight summer clothing. But even that was heavier than necessary. Lounging pajamas and houserobes were more comfortable and perfectly acceptable.

"House clothing," added the director, "is loose enough to be comfortable but tight enough to be revealing. When Miss Carey got her pajamapants down to her knees, out popped a snake."

Dr. Flanders snorted. It was too sudden.

"It wasn't seen very clearly. Her team members were more or less behind her and the light was dim," continued Stennis grimly. "They said it was about a foot long and of some dark color—no prominent markings. Apparently it didn't bite her. No harm was done except to Miss Carey's feelings—if that. She made no complaint, merely reported it.

"But, Dr. Flanders, what was that snake doing in there? Granted even with doors that close and lock themselves every time they're released, it's not difficult for a small animal to enter the service lines—there've always been a few mice. But how and why did it enter the city in the first place? Will the next one be poisonous? What precautions can we . . . must we . . . take? According to her report, Miss Carey and her female team members are sewing elastic into the ankles of their pants; the men have taken to wearing light boots with pants legs tucked inside."

At that Flanders could not repress a laugh. "The chances against having a snake run up a pants leg twice in one life are astronomical," he told the other.

"It's cosmological now," grunted the director, and Flanders chuckled again. "But that doesn't answer my questions. What was it doing there?"

Sobering, Flanders said, "You mentioned mice. Presumably it eats them—some kinds of snakes are better mousers than any cat."

"O.K., I'll buy that," said the director. "But how about the mice? When I was a tech in Maintenance, they were a minor nuisance. We thought they had got in while the

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city was being built and would gradually starve. We'd lay out poison and exterminate them block by block. But now I find that my men no longer use poison. In the old days, a few dead mice in a major air duct were not even noticeable. Now there are so many that our filters wouldn't remove the odor." He stared at the zoologist.

"*What do they eat?* Don't tell me we spill enough food and garbage for them, or that they can get access to stored food—food isn't stored in the city."

Flanders pondered that one for several seconds, said hesitantly, "We know that there were yellow jackets in the city. That implies the presence of other insects—it's hard to see how crickets and cockroaches could have been kept out. Mice eat insects."

"Just how did those yellow jackets *get* into the city?" demanded Stennis. "You know how well all our intakes are screened—not just external intakes, every intake and outlet in the city as well."

"I can only suggest that with all your millions of intakes, they can't all be perfect all the time."

Stennis groaned.

"I begin to see why you wanted a zoologist," grinned Flanders. "But are these incidents really an alarming problem?"

Stennis grunted and straightened up. "Wait'll you hear the next two. This one is a report by North, one of my best Sector Chiefs. It seems a delegation of women called on him last Thursday to demand that he get rid of a bunch of birds who were building nests over an entrance to their apartment building. Each of these fourteen women was *personally* acquainted with the nasty habits of these birds, and by the time he got them soothed and out, he needed his weekend. He sent a man with a ladder to tear out the nests, but he called yesterday and said the birds were still there, building new. The birds are brown and gray with black spots and white spots and markings. Sparrows, I suppose."

"Or wrens. They can go through any place you can stick your thumb. But is that serious?"

"It's a public matter—and *that* is serious. The public's confidence in Maintenance Department is a large part of their confidence in the city unit, itself. We *must* have their trust, or administration and government are impossible—we'd wind up evacuating the city in a panic."

"I see. These little things are merely irritations, but if the public knew the extent of the problem and how it was growing . . ."

"Exactly. And this next one *is* serious, though it's not in your specialty. We found one of our filtration substations—a big affair, you know—completely plugged with some horrible kind of gunky plant. Some kind of fungus growth. Here're pix of it."

Fleshy ripples of plant matter

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oozed out of a grille in a lacy pattern. It was obviously soft, wet, pulpy; a delicate pale brown, almost straw-colored. Other pictures showed the filters choked with fungus between the stacked pairs of plates; the water outlet plugged and water trickling down the duct; the squirrel-cage fans ruffled and flounced; the fluidic, no-moving-parts routing center, that dispatched filtered air to separate blocks in the area, completely choked.

"I've seen this kind of growth on rotten logs," said Flanders slowly. "But I also have a layman's understanding of your self-cleaning filters. I can't understand how the spores could have got into the city past them."

"Neither could we. Our first thought was the obvious one—the legal department filed suit against BioProdux, Inc. One of their factories is served by that station. They buy sewage and garbage from the city and manufacture plastics, paper, and a wide variety of raw materials, alcohol, glycerine, I don't know what all, in addition to the usual fertilizer. They use assorted bacteria, yeast, algae—and fungi. It *could* have come from them. We can't prove it, though, and we'll lose the suit.

"What'll it be next?" he groaned. "Moss in the pump stations?"

"So what you want me to do is to check over the whole city, find out where animals and plants are entering and why, and what can be done to prevent it. That's a tall order. I haven't the foggiest notion of where to begin."

A musing expression settled on his thin features.

Stennis became more hopeful. "It won't be as bad as that; I've alerted all sectors and areas to report signs of plant and animal life. I'll have 'em routed to an office here in Maintenance for you—Judy will fix you up. You won't have to go looking for incidents. My boys and girls are bright, and now that they've been told to watch, they'll spot more stuff than you can check out."

"Well, that'll at least give me time to come up with my own ideas," agreed Flanders, "and no doubt give me a lot of info I'll need for that. I'll settle in and check into that office in the morning. Let me have those reports you have there to study tonight."

Flanders, interested, scanned the reports in the outer office before going any farther. Then, mind full of the problem, he absently picked up his suitcase, descended two stories on moving ramps, and paused on the Cloverleaf Mall in front of the block. He had his choice here of moving Ways going in four directions—Maintenance had a location in the high-rent district—but couldn't decide which one to take. He realized then that he had no place to go, and made for the comm-booths.

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Seating himself, he punched for Housing and automatically scanned the cheapest, forgetting that he was on expense account. He chose a "basic accommodation" apartment house whose address caught his attention. That was near where a report had originated. Reserving a vacancy on the spot, he started off.

Designing a city in three dimensions is not easy. The first thing that comes to the designer's attention is that one set of streets is not enough, even if all freight is separately provided for. The bottom third of the city unit was devoted to industry; the top two-hundred-fifty meters with its thirty-two levels, sixty-four stories, was devoted to housing, shopping, amusement, et cetera, and offices and some light industry such as millinery.

Five separate levels of "streets" were required, assuming the streets weren't to become both too wide and too crowded. Each such level was called a "Wayrun" and they were numbered from the top down. These were of the "Waymeet" pattern, a square around the center of the city with sweeping loops attached to each corner—where the Ways crossed in cloverleafs—the loops as big as the square. In the center of each of the four loops and in the square was a Plaza, a great open space extending up to the next Wayrun six levels above.

Every two-story level, including Wayrun levels, was gridded with one-way moving streets that ran ten blocks or so—about a mile—looped, and came back one block over. Alternating levels were oriented at right angles. Descending or ascending one level from a North-South level would put you on an East-West level.

"Buildings" were merely volumes in a block. "Blocks" were one level tall by one by ten blocks horizontally—the full volume between streets. Technically, a "City Block" was a ten-block square volume between Wayruns, serving ten thousand people. The term "block" was also used to describe any large building, or volume, generally devoted to one purpose.

Basic accommodation, Flanders knew, was the standard two by three meter room containing a—comfortable—three by one-and-a-half meter bed that let down from one wall; a desk board that folded up; a closet; and a metered visiplate in the end wall opposite the closet, visible from in bed. It could be set on external-broadcast or City cables. One folding chair and a hook to hang it on when the bed was down completed the furnishings. "Basic" was the cheapest housing for singletons in the city.

He tossed his suitcase in where the bed would cover it and went back out. At the center of every story of the two-level building—shaped like two dominoes laid on each other at right angles—were public rooms, restrooms and bath-

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rooms, laundromats, et cetera, and escalator ramps. He was three stories up from the Wayrun, and though he could have exited into the one-way grid at his own level, he returned to Wayrun level. This apartment house, with its low rent, was not actually on the Ways, of course. He faced an ordinary one-way street here. At the opposite end of the building he could have exited onto a street going in the opposite direction.

Two-meter sidewalks bounded the strips. The first was a meter wide, three miles per hour, or a little less than the five kph, that was standard in newer arcologies. The strips were elevated four inches on a gentle slope that wheelchairs and pushcarts could mount. Next with the one-meter six-mph strip, another four inches up. Last was the two-meter nine-mph lane with occasional seats. Beyond it the acceleration strips descended in identical pattern to the other sidewalk.

This universal transit system eliminated powered wheels on the streets except for wheelchairs. Even the city's nuclear-electric sweepers, by law, had to be pushed.

A few minutes' ride brought him to the amusement arcade he sought. It was big, designed to accommodate ten thousand entertainment-seekers, and offered almost every inexpensive indoor entertainment known, except drinking and gambling—City ordinance prohibited the first here. Entrance was free, the entrances a row of ornate gateways opening on galleries. Inside, the arcade was seen to occupy one full level, eight meters of height. Its domed and ornate interior was reminiscent of ancient cathedral crossed with carnival.

Bemused, Flanders entered and strolled down a gallery offering views into rooms through arched openings piercing the walls their own width apart, as if the whole was some great colonnade. One room was a restaurant, entrance-free, with the usual automated service tables. Next to it, and communicating with it by the same sort of arches, was a ballroom. The arches here had pay-operated turngates. Exit free, but only chairs and restrooms provided for the dancers. To eat or drink anything required paying to get back in. Farther on was a room, entrance-free, with a mixed bag of games—pool tables predominating. Food and drink machines were thick there. In general, entrance-free rooms with pay-operated amusements alternated with pay-at-the-door establishments, and all rooms opened into the next ones.

Music fell from above and swirled around him. Flanders paid to enter a room devoted to political rallies, conventions, et cetera—currently occupied by no less than four club meetings—and was standing on the outskirts of a group of fantasy enthusiasts listen-

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ing to a speaker extol the merits of someone called "the Champ," when his arm was tapped.

A man in dark blue, with a dark-blue helmet having a red light on it, was looking up at him with polite curiosity. At least his flasher wasn't on. He swung his bright yellow plastic club absently and asked, "What's up there, Non? Didn't drop anything, did you?"

Flanders had been staring at the ceiling. Feeling foolish, he said, "The owners of the arcade called in Maintenance Department several days ago and complained about spider webs choking their mikes, and I'm more or less looking into it."

The cop gave his MPS working dress a chill look. "That's a Company rig, not City. You work for the arcade?"

"No. I'm a zoologist consulted by the Department, on loan from MPS," he said.

The cop read his sleeve and asked, "Got any credentials?"

Flanders felt sunk. "No, I just checked in today and they haven't been made out." It hadn't occurred to him that he'd need credentials, but it was obvious now. "Wait a minute. I've a personnel-requisition slip."

He produced it and the cop looked it over knowledgeably. When it was verified, he nodded and offered his aid.

It turned out he could provide plenty of help. Though attendants were not obtrusive, the arcade was manned. He dug out the men and ladders employed to clean the speakers on two past occasions. Presently Flanders was at a dizzying height above the clubroom, peering at the brightly-tiled ceiling.

It was acoustic tile, providing an unsurpassed walking surface for insects. Further, it was shrouded with dust-coated draglines laid by spiders, with webs, with dried remains of trapped insects—and egg sacs.

But where do all these insects come from? he asked himself. *What do they eat?* He dug out pencil and paper and noted the presence of cricket remains, silver-fish, and moths. The area around the speakers had been cleaned. The speakers were exposed for easy access and therefore, made good anchor-points —the light-panels were inset.

On the floor he shook his head at the questions of the manager who had got wind of the proceedings and come down. "I'm afraid I can't even give you advice," he said. "I'm still collecting data myself. You might sweep the ceiling and spray it with spider-specific spray. I haven't the faintest idea what brings them in here, or keeps them here." *What do they eat?*

The last question was to himself, and it was the last thing he thought before he slept.

When he checked into the small office assigned him—twice the size

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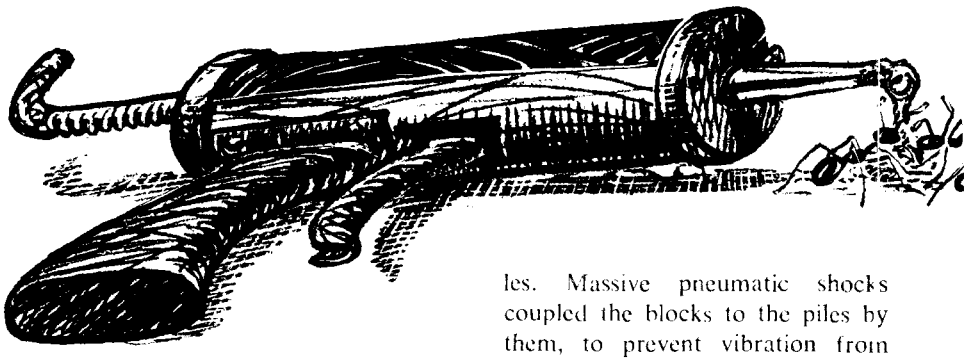

of his "basic accommodation" cubbyhole—he was relieved to find that credentials and even a Maintenance badge had been provided for him. The badge was supervisor grade and would take him anywhere in the department.

The first report to attract his attention concerned ants. Ants are scavengers. He pocketed the reports and set off.

Presently he was many levels down in the industrial sector where streets were fewer and farther apart and vertical travel was mostly by elevator. His badge got him back behind a factory whose faint murmurous hum did not shake the floor or walls. A door was unlocked and Flanders, fascinated, saw one of the massive piles that supported the city. It was a curving, glassy surface meters in diameter, with projections from which blocks were hung.

His view of it was restricted. The hole in the city was polygonal, with the support projections in the angles. Massive pneumatic shocks coupled the blocks to the piles by them, to prevent vibration from being transmitted—the city never *touched* its supports at any point. There was just room to slip his hand between the pile and its enclosure, and the pile itself was almost obscured behind the pneumatic coupling this access door uncovered.

Peering down past the support projection at the glassy surface, Flanders saw a line of small black ants, quite ordinary in appearance, coming up from below to pick at the heavy grease that oozed out of the pneumatic coupling's seals. The grease had dried almost to wax in spots around the edges, and it was this wax they were after.

"But do they cause any trouble?" he asked the Maintenance man who had discovered them.

The other scratched his head. "Trouble? No. That grease—that's waste anyway. Seal's not perfect, you know—too much pressure on it. That can't hurt anything, but the boss said report any animals or bugs, and I remembered these li'l critters. That's all."

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"But they can't eat that stuff that's heavy hydrocarbons," Flanders muttered.

"No 'tain't, it's silicone with seal-wax added—special-made for pneumatics," volunteered the other surprisingly.

Flanders pulled his head out of the doorway and stared at him. "I fixed this coupling just last week, and I read the label," the other added.

"Can you get me a copy of that label?" Flanders demanded, grabbing his arm.

He looked surprised, nodded, and blinked. "Back at the Area Storehouse."

"And I want to take a look at the bottom of this pole."

"That's not in this sector, but take the number of the pile to Fourteen-Four-Thirty and they'll show you. I never saw the bottom of one myself."

Flanders noted the pile number and later copied down the label, complete, of a drum of the pneumatic-coupling grease the city used. He was *very* interested to discover that the seal-wax was not a hydrocarbon. It was natural wax! Probably a mixture of natural waxes, refined from plants and processed God knew how all, but edible all the same. In the old days it couldn't have been used because of corrosion, but the elimination of metals in mechanics made it possible, and the oil-shortage made it cheaper.

So they weren't just lining their den with it.

But he wasn't able to examine the den itself. On the ground level, he saw only the same thing he'd seen above—ants coming up past the lower-most coupling. Even the lower levels weren't on the ground, though the really heavy factories had their own short piles. He couldn't even slip his hand down into the hole the pile stood in, but he was satisfied that the ants actually had access to the subsoil that was all that remained when the bulldozers got through preparing the site for the city.

There was no way to find out what else they ate.

Flanders pondered awhile, made a note to investigate all the greases used in the city, then recalled an-

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other report from the industrial section.

A long ride took him over and down to the freight depot. He discovered here that most local truck freight was floated in by the freight subway. Outside the city, the really big trucks with large loads dropped their containers into the intake end; and, of course, any really large cargo had to go out by subway—the highway was inadequate and the railway was not local.

The subway, or ways, were broad channels in the floor, sloped slightly down into the city or slightly down going out, and about two miles long. The containers themselves were slid into them and floated by aircushion valves in the channels. The valves were open only when a container was over them, and gravity drove the containers; a much cheaper and more efficient transport system than the moving ways.

When a container, moving pretty fast, reached the end of the channel, it split in two. An ikon read the code number on the container's end and tilted the floor to one side, or the other, to route it. The routing center branched like no tree that ever grew, spreading and joining; a container might be switched a dozen times before being lifted up to the freight channels that took it across the city and deposited it in the proper Sector, where it was finally routed and floated to the customer's factory door.

At the depot they showed him a shapeless blot of red fur with a bushy tail.

"Fox squirrel," he said automatically. "What happened to it?"

"It got between a container and the bumper in the elevator," they told him.

"You mean it was *riding on a container?*"

"That's right. Been quite a few that came in on containers. Herb shot one a couple months ago and took it home and ate it. Uh . . . I mean, he *got* one a couple months ago."

Flanders blinked and then grinned faintly. Firearms were strictly prohibited inside the city unit, even police used airguns firing drugged darts. "But you say there've been quite a few? What happened to the rest of them?"

A shrug.

Flanders looked around, frowning. The depot was big, full of elephantine moving containers, and seemed unmanned. Incoming containers moved briskly through the automated router. They were made of tough, strong synthetics with slick surfaces, but had enough irregularities—hinges, clasps, and the locking brads that held the sides together—for squirrels to climb. They were of three types: liquid, dry bulk, and general purpose.

Aside from the containers, there was nothing in the depot that could attract any animal. Half a kilometer wide and almost as deep, the

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ceiling was meters over their heads and the floor even farther below—they stood on a grid of catwalks that were suspended over the channels. In all that area there was nothing to eat or drink.

"Would it be possible to stop one of these containers so I could take a look at it?" he asked.

"Not very easy. This thing is computer-controlled, and it'd be difficult to single out a given container. I could block off a branch of the channels, stopping everything in it. But it'd be hard to stop a single container."

"I want one with food in it—a bulk container if possible."

"Can't do it. We have no way of knowing what's in a container."

"MPS, at least, owns its own containers—we can go by the trademarks."

From above the entrances to the elevators, they watched endless rows of them glide up, hesitate, and bump against the back walls of the shafts. From below, endlessly, grids snapped into position in the elevators to take the weight of the containers, then were motored up the shafts with their loads.

Finally three of MPS's bulk containers appeared in line, and the Department of Transport man hit the manual stop. The aircushion disappeared and the resistance casters in the bottoms of the containers turned momentum into heat. The first one bumped into the elevator shaft and the others banged into it. By the time they reached the elevators they weren't moving very fast. The traffic computer reacted with lightning speed, rerouting containers around the blocked elevator. Only four containers were trapped.

Flanders dropped off the catwalk onto the second one, knelt, and deliberately sniffed of it. Corn meal. He made a long step onto the first one, inside the elevator shaft, and sniffed again. More corn meal. But the last one contained soymeal.

As he had thought, the containers weren't actually airtight, though they no doubt were spilltight and insect proof.

The Transport tech released the elevator and led him to the personnelway when he mentioned the truck docks. Flanders had half-consciously assumed he'd have to check a City car out of the garage on the other side of the city unit and drive around, but the tech heaved up a two-seat scooter and dropped it into a tiny aircushion channel, anchoring it with a toe.

Flanders stepped gingerly onto it. It was nothing but a flat rectangle one by two meters, on which were two seats and a little handrail at the bow, just in front of the front seat. Flanders stepped onto the center of gravity of the scooter, between the two seats, hesitated until its pitching subsided to a rapid tremble, and sat down. The tech lifted his toe and the scooter

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backed slowly up to the end of the channel.

It was horizontal here, and sitting down in the back seat tipped the bow up. He leaned forward, took hold of a bar beside the channel, and heaved himself forward. The scooter slid out of the scooter garage into the routing center, tipped downhill, and slowly, dreamily, crawled across the floor.

The catwalks were far overhead. On his left, looming titanic over him though they were meters away, the containers hissed past. They had both a higher initial speed and greater weight, and passed him constantly. To his right, but farther away, were incoming containers.

He was going as fast as he could jog by the time the tunnel opening in the far wall of the depot swallowed him, and he continued to pick up speed. So did the containers. Soon they were *whooshing* past him, their slipstreams making the little scooter rock. And still he picked up speed, until the tunnel wall to his right blurred past. There was nothing to keep him from jumping out and breaking his neck. And still he picked up speed. It was two miles to the truck docks, and his *average* speed must have been fifty kph; it only took a few minutes. He finished the trip sitting rigidly still for fear that the slightest shift of weight would flip the scooter out of the channel.

Then the channel tipped steeply up before him and his momentum was drained by the climb, so rapidly that he was thrown forward against the front seat. He was still moving swiftly when he topped the slope, but now he was in control of the scooter. He stuck his toes out against the tops of the channel on either side and braked himself to a stop in the scooter garage under the docks.

There was nothing to see here but outgoing containers being lifted up to the dock level. The personnel elevator took him up and he looked around, not approaching anyone.

The place was big, but not as oppressively huge as the subway depot. Lines of big nuclear-electric semi rigs pulled up beside the elevator heads, doors in the sides of the trailers were opened, and containers were taken in and floated back on the trailers' own aircushions. Flanders walked past a holding pool where containers waited until their trucks arrived, and outside.

The doors opened and closed for each truck unless they were in close line. Across a lawn was the back of the intake end, a broad low building almost a mirror image of this one. Beyond was a wide long-grass lawn with roads looping across it; farther on were a parklike forest and wild fields. From the highway, the place was scarcely visible. Undoubtedly there were squirrels and birds in the area, but the combination of traffic, lack of food, and doors would prevent them from entering the buildings.

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It was not at all difficult for squirrels and insects to get on containers at the packing and processing plants, however, as Flanders well knew. The plants, like the barns and husbandreums where animals were raised, were built on land not easily plowed by the giant machines the farming companies used—hilly land and rocky. Such places were also, by both Federal law and state law—and, more important, economics—abandoned to nature.

Not many squirrels would get trapped in a truck and transported into the city unit on a container, but with a million people to feed on a day by day basis, it must happen pretty often. Now that he thought of it. But he simply wouldn't have thought of it if the fact hadn't been pointed out to him—and neither had the city's designers.

The squirrels didn't matter, but the insects did. They'd be transported all over the city-unit in the container channels. And how about mice?

More thoughtful than ever, Flanders returned to the city and wandered up onto Wayrun Five. A feeling of familiar unease translated itself into hunger. As usual in his work, he had forgotten dinner, and it was now 1400. Going up to Wayrun Four, where his apartment house was, he approached the building but did not enter it. Affiliated with it—and with other apartment buildings in the block—were a number of restaurants. The biggest and cheapest could seat as many as a thousand at a time. Simply by presenting his Unident and punching the name of his apartment house, he could put the tab on his rent bill. A meal in these places cost a flat sum, extras plus. The cheapest was a dollar, which, with his basic rent of three dollars a day or twenty a week, brought his basic expenses to a mere forty-one per week. Survival on forty-five a week was not impossible.

This result of the rationalization of production and distribution made possible by the modern techniques generally summed up under the catchall term "arcology" was the primary reason for the rapid growth of city-units and the almost equally rapid transformation of existing old-style cities into less well-integrated arcologies. The problems and, therefore, the cost of housing and feeding and clothing people, were simplified to the minimal—and the city transportation system gave them a better chance of getting and holding jobs. Within a quarter century, eighty percent of the country's population would live in arcologies.

And that, thought Flanders, eating, made his job very important. As Reade Stennis had said, confidence in Maintenance, Transport, and other city departments was essential to life in an arcology, and

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the philosophers who conceived them in the latter part of the last century knew it well.

The apartment house with the nesting plague was on Wayrun Two. He located it horizontally and rode back to the Ways to ride to a point under it.

The Ways sprawled sloppily across the one-way street grids, forcing many streets on the Wayrun levels to loop and return far short of the usual mile length. Flanders stepped off at such a loop, walked down under a high-arched entrance blazing with Indian-like abstracts, and past an area off which led ramps up to the sidewalk by the Ways. Beyond were the low tunnels giving access to the Ways. From their midpoints, ramps led up to the centerwalk between Ways. Rampheads on the walks were circled with railings, and some had softly-glowing signs giving the names of the streets they communicated with. The tunnels of those without signs led only to the area giving access to Wayside buildings.

Standing on the centerwalk, it made no difference which Way you chose to mount, it approached you to pass on your right side. You mounted facing into it, walking to your right. The pattern of strips and lanes here were identical to those of the streets, except that the nine-mph lane was just another one-meter acceleration strip. The first lane was the fourth strip, the twelve-mph. It was two meters wide, with scattered seats. Two more acceleration strips, and the twenty-one-mph lane was three meters wide, with more seats. Another two strips, and the last lane was the thirty-mph, four meters wide, with a jointed transpex barrier bounding it. Beyond this moving barrier was another, motionless, so that it was impossible to touch anything with a velocity difference greater than five kilometers per hour.

The high-speed lane was about a hundred centimeters above the centerwalk and the two sidewalks beyond the barriers. The sidewalks were two meters wide, had rampheads from the access tunnels below, and gave room for Wayriders to read the glowing—never flashing—signs flat to the buildings' fronts. Restricting signs to simple names and readable script produced by reaction elaborately ornamented building fronts, each as different as possible from the rest. Block signs and street signs were hung over the Ways, easily seen, and the names of all public buildings and "name" status commercial buildings also, in different color and script from block and street signs.

The Ways were two levels, sixteen meters, high, but on the next level above, the streets were the usual tenth of a mile apart and, therefore, crossed the Ways at odd angles every one hundred sixty meters, or so, around the Loops. They were twelve-meter-wide fabrics of

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fantastic arabesques dropping from the ceiling, view windows caught in a lace of modern abstract patterns in them. No two patterns were alike, yet the color-scheme used on a given Wayrun was always the same, with minor variations differentiating blocks.

Flanders had hardly seated himself on the high-speed lane when a distinct, authoritative sound cut through the hum of the Ways and the murmur of the crowd. It might best be described as a chirp; at least in a language that describes a cow's low as "moo" and a cock's crow as "cock-a-doodle-doo." It was a distinct bird sound, actually indescribable, and not one that the zoologist had ever heard in the middle of the afternoon.

He jumped out of his chair to shuffle hurriedly down the Ways, looking up, and ran head-on into some soft someone who had just stepped up onto the highspeed lane. They clutched each other to keep their balance, teetering precariously on the edge of the lane.

The other, a girl, grunted, "Another time, Non, look now, leap later."

But, hearing the muffled flutter of wings, Flanders gasped, "Let go!"

Out of the corner of his eye he saw her face go beet-red with anger but, catching a glimpse of wings, he was unprepared for the push that separated them. He stepped back, then over onto the acceleration strip, knowing they were pulling away from the bird rapidly.

He almost sat down, having stepped down backwards. He staggered back rapidly, caught himself, and then, turning, descended the Ways at a practiced shuffling run that stopped just short of spilling other passengers all over the strips behind him. He paused for only the briefest of glances on the centerwalk, then mounted the return Way quickly.

Presently he was abreast of the place where his collision had occurred. He descended, looking at the ceiling far overhead, wishing he had his electroniscope with him. But the bird was low, within the barriers.

It was red-brown, spotted, as big as a pigeon. It made a sharp, irritated sound and dived purposefully at a ramphead leading down to one of the streets. At that moment a member of the New Generation emerged, statue-tall and solemn, and stepped off the Up ramp. The bird stopped dead in mid-air, its tail dropping almost forty-five degrees below the horizontal, and hovered for three or four seconds, holding itself in position with rapid sculling beats of its wings. The flutter was soft-edged, but audible.

The NG was tall, robed to his sandals, and had the elaborately piled and teased hair, each wrist-thick cord of the intricate setting dyed a different color. "He" was either clean-shaven or female.

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For a moment they stared at each other, then the bird made a disgusted noise and flicked past him to drive swiftly down the ramp.

"No, Nonny!" Flanders heard the NG mumble, looking after it wide-eyed. "Pigeons, yea; sparrows could happen, yea—but wildings? In a city? Never happen, Non!"

He pushed past the muttering one and ran down the Down ramp, up the tunnel to the street, and looked around the loop. A flicker of motion caught his eye—in the wrong direction, of course. He set off after it along the sidewalk, drawing stares he never noticed.

A one-way street was roughly a mile long, then it made a half-circle whose radius was half a block, and went back. This one, because of the Ways, was less than a quarter of that. Inside the loop at the other end was a little Common, one of whose features was a curving, transparent-walled Vertical Way leaping from floor to ceiling boldly, unsupported. It led from one level to the next above and below. Such Vertiways were placed in most street Commons. You entered between lanes, in the centerwalk.

The bird disappeared inside, and before Flanders could follow, he collided with a little group of young men who were just stepping out of a bar. The Common was a miniature shopping center.

"What is it, Nonny?" demanded one of them, blocking his path.

"Chasing a bird," panted Flanders, vainly trying to peer over him.

One of the others guffawed. There were three of them. The one who had spoken put a hand on his arm, squeezing gently. "Well, Non, you found him. But you know, it's not a good idea to go chasing birdies all over the city, now is it? Especially without *my* permission. Right, jocks?"

Their agreement was cut short by a panting arrival at Flanders' elbow. "Want to talk to this guy," this one said, breathing heavily. "But not to you—yet. Move on."

"And if we *don't*" suggested the arm-squeezer, leaning to look past Flanders. His eyes widened at sight of the blue helmet, but he made no attempt to withdraw his suggestion.

The cop looked him coldly in the eye for one second: ignoring the other two closing in menacingly; long enough for him to back down. Then his yellow club streaked to *clonk* resoundingly off the tough's head. Before the stars had flashed and died before his eyes, the end of the club sank inches deep into his soft belly—not the solar plexus. And as he doubled, it streaked up, the blow pulled at the last moment, to clack his teeth together.

With a menacing movement of his shoulders the cop whirled on the other two, now somehow between Flanders and the three. The other two had been within arm's reach before; now they were

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well out of club range. He nodded at them and pointed with the club. The three got.

He turned back to the tall zoologist, a youngish type, thick-shouldered, with a round, lumpy, pale face blotched with bright red freckles like sunburn. If his mouth had been wider and his jaw a little less noticeable and his forehead a little lower, he would have looked a lot like a frog. He looked very good to Flanders.

The theory was, he reminded himself, that arguing with cops was permitted, but if you challenged them, or began a quarrel, they could deal out Justice—if not Law—on the spot. If in their judgment that was preferable to cluttering the courts with your case and maybe leaving a black mark on your record.

The club touched Flanders's stomach. "Go easy on the Ways, tall man; you broke nearly every traffic reg in the books. Those're misdemeanors, you know—but you know that if anybody'd been injured in your tarzanate, it would've been a felony. I could really put it to you—speeding, recklessness, negligence, collison. You know that, don't you?"

Flanders nodded, recalling his wild career with an effort. "It's not the way I usually leave the Ways," he admitted. He explained about the bird, saw disbelief change to concentration in the cop's eye, and presented his badge and credentials.

The other checked them, nodded. "We got a directive about this from Maintenance, interdepartment cooperation. We report any animals, bugs, like that, to a certain number." He checked his notebook and found that the number corresponded with the number of Flanders's office.

"O.K., this once we'll forget the tickets. I meant to anyway. By those clothes you're from out of the city. But even a super's badge don't give you permission to break anybody's neck on the Ways—not even your own. Remember that."

Flanders remembered to carefully check the Vertiway, but the bird was gone. Apparently it knew its way around quite well. From the first it had acted as if it had a definite destination in mind.

Pondering that, he stepped on the street and rode back toward the Ways. A hand on his arm brought him out of his thoughts.

"What was all that about?" asked a girl with an intent, pretty face framed in wavy, taffy hair.

Flanders looked at her, noted that she seemed vaguely familiar, but couldn't place her. Her dark amber eyes reminded him of someone, as did the tiny frown between them. He explained yet again about the bird, abstractedly.

"I saw it! What kind was it? I never saw one like that before."

"Whippoorwill. Kin to the nighthawk; nocturnal and insectivorous. You can't mistake the way they

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hover with quick quiet wingbeats, or the nervous, flicking way they fly. I wasn't really near enough to verify the markings, but that's what it was."

"But I don't understand. It isn't night even outside, and it never gets dark inside the city."

"True, and that's suggestive. If the bird just got in, it's no wonder it was flying around by day. Or if it had been disturbed. But it acted like it knew its way around quite well, thank you. They usually fly by night. But if it lives in the city, it's used to light. So, if it got hungry by day, and it's used to light, why not go hunting. There are no predators to bother it."

"*Can* animals really change from night to day like that?"

"Not very easily," he mused. "It's eyes are reflective, like a cat's or owl's, and it sees red-orange light best. But it could. Owls actually think little of flying around by day—great horned owls, at least. So far as I know, they only hunt by night, but they can take daylight well enough for ordinary flight."

"I didn't know they ever woke up during the day."

"No animal sleeps twelve or more hours through. Whippoorwills occasionally hunt by day. They like a lot of light—moonlight and dusk. If it wasn't partly for predation, partly for competition, they could probably adapt to daylight operation successfully. It would take a long time, and a complete change of environment—and then it would only be adaptation. Evolution has equipped them for night operation. But evolution is a continuing process. They could even re-equip themselves, given enough generations."

They took the ramp back up to the Ways, waited until a shouting group of children playing tag on the strips was carried past, and mounted to the high-speed lane. Flanders discovered that he was explaining his investigation of the city's animal life to her. It seemed to interest her greatly, and she declared herself in on it—if it was all right with him.

It was. It never occurred to him that Reade Stennis might have wanted the investigation kept secret.

At the apartment house with the bird plague, they discovered that it was a middle-class place featuring an elaborately ornamented face. Curlicues and architectural gewgaws, reminiscent of Notre Dame Cathedral, covered the building front. Directly over the door was a sort of shelf, the top of the ornate gatelike entranceway. On it were about six or seven partly-built nests.

They couldn't see much from the street level, but Flanders had climbed many trees in his career, and decided not to bother the local Maintenance office for a ladder.

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The ornamented front was not too difficult to climb. And it was not far to the top of the entrance, and the composition flooring was probably softer than rocky soil.

The birds were sparrows. They flew from ornament to curlicue and scolded shrilly, boldly. There were as yet no eggs in the incomplete nests. What interested him most was the nest materials.

They were made of gum and candy wrappers, cigarette packages and butts, bits of stray wrapping plastic, string, thread, hair, feathers, paper, lint, and an amazing collection of dropped stuff, including false eyelashes, bracelet charms, parts of plastic toys, old-fashioned buttons, a baby's street slipper, the discarded felt filler of a pen, an artificial flower, a handkerchief, and part of a woman's—strictly ornamental—plastic-straw hat.

Flanders dropped with a grunt, shaking his head in amazement. "I never knew there was so much trash floating around the streets," he told the girl, noting down everything he had seen. "But they can't eat that kind of stuff. What do they eat? Do they get it in the streets or Ways? If not, where do they get it?"

"You said you thought they ate insects."

"Sparrows will eat anything. But even if they do eat insects, that just puts it back farther. What do all these insects eat? There's got to be some source of food somewhere in the ecology. Outside it's plants under sunlight. Here, the only source is people—but the city was designed specifically to avoid that kind of inefficiency." He hesitated, remembering the ants. Might there not be a lot more such leaks in the system?

"Well, what about these birds?" the girl asked. "Do we try to follow them and see what they eat, or what?"

Flanders became aware of the small group of bystanders that had collected around them. He looked back up at the nests, hesitated, said, "I suppose we should. Someone should. I wish I had my 'scope." He became conscious of all the other reports awaiting his attention, and an urgent feeling that he couldn't take the time to follow this up any further. It was not a new feeling; and when you couldn't be every place yourself, you enlisted the aid of others.

He turned to the bystanders and suggested that they keep their eyes open, look up whenever they heard wings, chirps, or caught a glimpse of a bird. "They probably feed off the ceiling," he added, remembering the ceiling of the amusement arcade. "But watch and note everything they eat, or at least the place where they are when they're feeding. You might form a club or something; you'll find it very interesting. I'm Flanders, and I'll be back in a few days, I expect, unless

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something comes up. I'd be happy to hear about anything you see. And I might be able to add something to it, myself."

They seemed to like the suggestion, though, of course, they made no move to constitute themselves a birdwatching club on the spot. Flanders had had experience in persuading the uninterested to help him. He turned to the girl and said, grinning, "I never thought arcologies would have to worry about bird-droppings. It reminds me of the Mad Scientist who concocted a formula for bringing things to life. He slipped into Central Park one night and shot it into an old iron statue of a general. With a creaking and groaning of rusty joints the statue climbed down from his horse. The Mad Scientist was delirious with delight. 'I've given you life!' he cried. 'What are you going to do with it, General?' The general whipped out a pistol and rasped, 'First off, I'm gonna shoot about two million pigeons!' "

They left the crowd laughing. One called after them, "Better check the statues in the Plazas for bird signs!"

"That'll get the job done at no cost, and a lot faster than we could—maybe. Never underestimate an interested amateur—if you can get him interested."

"Where to now? The Plazas?"

"I think we'd better check up on Organic Refining Company's head offices on Wayrun Three."

"What's down there? More birds?"

"Yellow jackets."

"What're yellow jackets?"

The girls in the large outer office seemed upset when he explained what he wanted—once they understood he was talking about the bees. They had to wait until a Maintenance man came to unlock the door. With a nervous crowd of secretaries and men on business crowding the far wall, Flanders slid the door open halfway, making everyone gasp, and looked into the cluttered service corridor.

It was a short branch off one of the main lines. The compressed air pipes in a row along one wall indicated that one of Transportation Department's small container channels lay beyond it. Tiny containers two meters square in cross-section delivered food and shop goods to the stores in the upper city. The corridor branch was only three meters long, if that. In the far end was the intake end of one of the big filtration substations in the major service line beyond; a dozen big air ducts emptied into the corridor to pass their air through the filters into the main line. Dust filmed occasional surfaces.

The one-and-a-half meter diameter grille was lying across some of the boxy equipment with which the floor was littered. Everything was quiet. Flanders stepped in, moving easily, and let the door slide mostly

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shut behind him. The taffy-haired girl who had appointed herself his assistant elbowed the Maintenance man aside and peered after him through the narrowest possible slit.

Flanders walked halfway and looked. Tiny yellow spots were visible here and there, by no means carpeting the floor. The murmur of the fans and the container channel beside him drowned any wing noise out, but he saw none moving. He walked quietly up to the yawning intake and looked in, wishing he had a flashlight. Presently he made out scattered bodies under the big squirrel-cage fan just behind the grille. Yellow jackets are not noted nest-builders like paper wasps; they prefer to look for crevices.

The fan was shrouded, of course, and all its output was channeled through two collectors and fed into the filters at high speed. Once under the shroud they were in dead air, but if they were caught, they were blown into the slitlike collectors. Flanders was willing to bet that where these collectors entered the filters, there was a pile of dead yellow jackets and their prey. The filters would have to be cleaned.

As Sweeney had said, the clip ring was worn away in ripples easily large enough for yellow jackets to enter. Flanders reached under the fan shroud, wincing as it came on, and raked out a handful of dead wasps and—he made hasty notes—spiders, moths, moth caterpillars, and crickets. There were even a couple of beetles. That was new.

He looked at the grille, shrugged, and went back out. "You can clean them out anytime," he told the relieved Maintenance man. "The zap-spray did the job, finally. You'll have to clean them out of the filters, too. That's what cut intake here."

"Now what?"

Flanders looked at the office's comfortable chairs and sighed. "Well, this is easily understood," he told her. "That corridor is naturally not airtight, and it gives the little buggers—if you'll pardon the pun—access to Lord knows how much of this block. They mostly stay in the service regions, I'd guess, coming out also into the streets. They can't enter ordinary rooms because of the filter modules behind the outlets. Let's go some place where we can rest."

"It's getting late. Not too early to eat something, is it?"

"I just ate, but I'll pay just to sit. There're lots of things we can do, but I feel I should think over what I already know."

It was 1600 and the office was closing. They rode back to the Ways and stopped at the first big restaurant they came to. The big ones were less expensive. They ate ice cream and Flanders thought.

Apparently assorted insects were at the bottom of the food chain.

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They were small enough to make use of the tiniest quantities of food, and many of them were capable of eating ordinarily inedible things—natural fiber, for instance. The spiders preyed on them, in quantities enough to feed small wasps—a large den of them. Wasps were not exclusive about their food, of course.

The birds could and did feed on insects of all types, and most of them could eat any dropped food. They'd have to find out how large an item dropped food was in their diets, he realized uneasily.

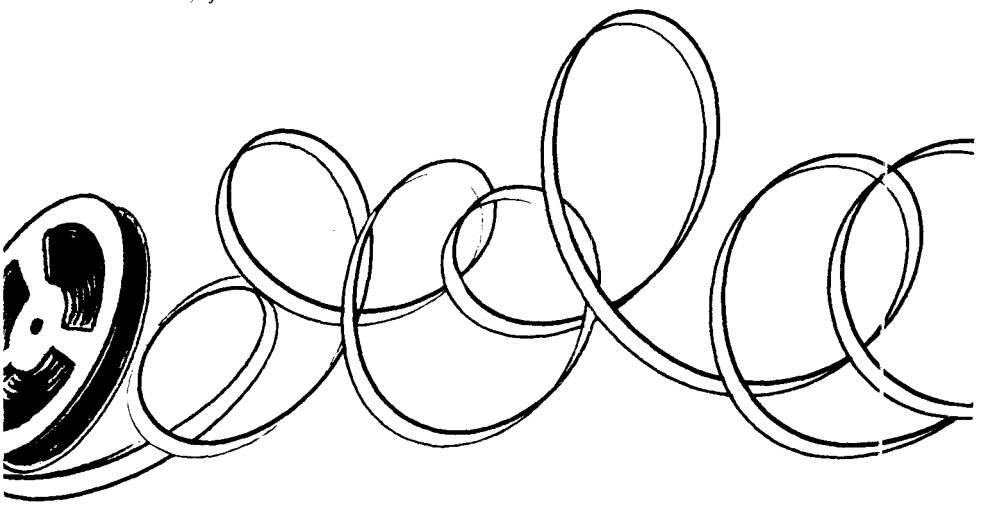
Most likely the birds, like most of the insects, had come in through doors and windows open on the outside. Grilled and screened air intakes in the rooms would not stop them. Come to think of it, they would not prevent insects from spreading throughout the city, either. They didn't need to travel the air ducts, just to wait until doors were opened. And, of course, there were the container channels.

He should have realized that when Stennis mentioned it—Michaels, the Liaison man, had hinted at it before.

Birds, then, could be excluded from the city only by eliminating all insects, unless they got most of their food from the streets and Ways—a tall order.

The enigma of insect food supply was the crux of Stennis's problem, and Flanders suspected, from what the ants ate, that there was no simple answer to the question: What do they all eat?

They went on to the nearest of the Wayrun's five Plazas and watched for birds while Flanders continued to ponder. The most useful thing he got was rest, but they



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did see sparrows and other birds. Not in large quantities and rarely close enough to identify them with certainty—Flanders was still without his 'scope.

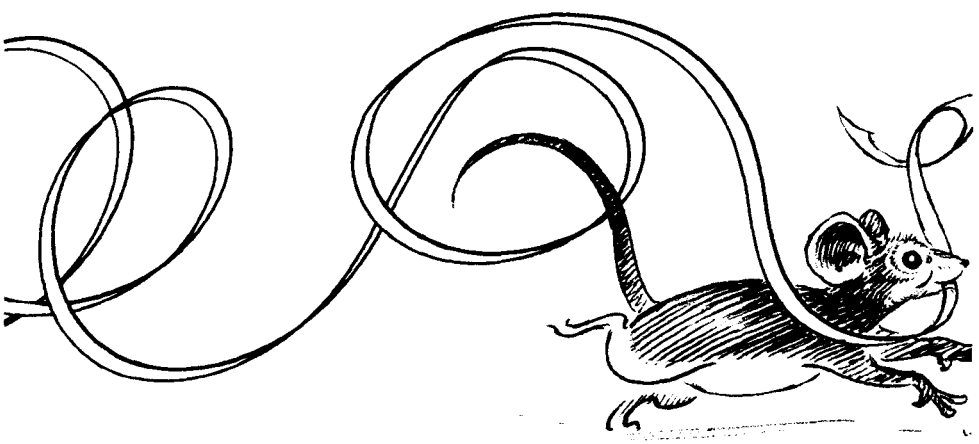
"I think they spend a lot of time away up there at the ceiling," the taffy-haired girl decided.

Flanders considered the Plaza. It was a fat oval two hundred meters on the long axis, almost sixty meters high—it extended up to the next Wayrun above. Its effective size was even larger, for many restaurants, night clubs, theaters, et cetera, opened on it and occupied the area all around it. It was connected to the Loop of the Ways by three multi-lane, two-way, low-speed Ways of its own. Its lawn was broken up by statues, fountains, shrubbery. Children had separate playgrounds. A small-animals zoo featuring mostly trained animals native to North America extended partly into it.

This Wayrun was seven levels tall instead of the standard six, and every story opening on the Plaza had open balconies on which people were beginning to appear: some private, some more or less high-priced restaurants, ballrooms, night spots, et cetera. The ceiling, as usual in the city, was plated with lux panels, and here great globes dropped from it to throw cones of UV light on the grass and shrubs. They were off now.

The Plaza was one of twenty-five on the five Wayruns. With the smaller Malls at the corners of the squares where the Ways crossed in cloverleafs, plus playgrounds, zoos, Commons, et cetera, they served people's need for public areas for social grouping. With twenty-five "city centers," facilities were not overcrowded as in old-fashioned cities even smaller than Sheldon Forks.

"How about by the zoo?" Flanders asked.



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They strolled over, bought more ice cream, and Flanders indicated spilled popcorn and peanuts. She nodded, an intent frown between her brows, and indicated various plastic wrappings from candy and gum. He found a sucked-on piece of candy, dropped by some child. Looking farther over the Plaza, they found a surprising amount of dropped food. The grass here was a good place to find it. It wasn't swept as often as the streets.

Candy and other food might be more common in the streets and Ways than he'd suspected. He hadn't *seen* any, that he remembered, but he hadn't been looking. The streets were swept several times a day.

The taffy-haired girl nodded. "The best place to look would be under the seats," she told him, amber eyes darkening. "I've noticed they're not too careful about getting under them."

They wandered about the city until quite late, watching mostly for birds and discussing the invasion of the city. Flanders found it easier to think out loud. Her questions helped to clarify his own thoughts, and she was able to suggest many possibilities. As a lifelong dweller in the city-unit and an amateur student of arcology, she knew it well.

Flanders normally rose about dawn, his habits corresponding to those of the animals he studied, but this time when he woke he dozed off again—also normal for him when he had no cause to get up early. He was not used to staying up late, though he frequently watched all through the night.

It was a chime that awoke him again. He hollered, "Come in," took a breath and got his eyes open, and the chime came again. Then he remembered that he was no longer in the fields, sharing an apartment with the senior specialists. The door was nearly soundproof. The visiplate was lit, merely glowing whitely. Then he realized it was the telephone chime.

He groped for the controls at the head of the bed, peered at them to make sure he wasn't transmitting vision, said, "Go ahead. Flanders here."

A trim, uniformed young woman with a severe face appeared over his feet, glowing letters spelling out "Entrance Monitor" and the name of the apartment building in the air just below her.

"A Miss Burke to see you, Mr. Flanders. Shall I send her up?"

"I don't know any Miss Burke," frowned Flanders sleepily.

"She will be waiting for you here in the lobby, then . . . wait, she says to tell you that you met her yesterday and you looked for birds together." The top-sergeant looked suspiciously past the video ikon.

"Does she have taffy hair?" asked Flanders, awakening abruptly.

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The monitor looked disapprovingly at the ike, but nodded shortly, lips compressed.

"Let her come up."

Nonresidents were not allowed to go wandering about the building unless vouched for by a resident. They could enter only at the monitored main entrance on Wayrun level.

By the time she knocked, he was nearly dressed. He reached out and toed the door lock. "Be with you in just a minute, Miss Burke," he said, reaching for his shoes, "if you don't mind my skipping my shower."

"That's O.K.: I'm here a bit early anyway. But the 'Miss Burke' is not. It's Garaden Burke—Gari to my friends."

He grinned at the wry expression of her expressive mouth. Garaden had been an historically important spaceman, much in the news when Flanders was young. "Then it's Gari to me as long as I'm Gil to you," he told her, standing up and kicking the bed up against the wall.

"Look what I found," said Gari, handing him a piece of paper.

It was a sheet of the permanent silicone paper used for books. Most people used either microfiche or capacitronic record crystals, but they required libriscopes, book-viewers. This sheet, he saw, was a page from a newspaper, copied from the reusable plastic on which her telefax had printed it.

One item was blocked in black ink and stood out. It was a humorous suggestion that W5L4 Soleri Street E was haunted. The reporter claimed to have heard the ghosts whistling plaintively, as if trying to tell of some awful disaster, personal or public, past, present, or future. Perhaps the Administration should send its trend projectors down to analyze it. It might be future.

"Are you thinking what I'm thinking?" she asked, amber eyes bright.

"It's probably some kind of bird, all right."

"Owls, *maybe*?"

"Screech owls? Could be. They're small birds that whistle."

"Why not hoot owls?"

He hesitated. "A great horned owl is all of two feet long. The barred owl is about as big and much noisier. And while they might eat mice—do mice run around the streets at night? Why not, come to think of it? We'll have to check on that. But if they don't, the other birds are the only things owls could eat. That we know of," he said worriedly.

"Well, we'd better do most of our birdwatching at night, then—for awhile, anyway. Beginning after midnight down on Wayrun Five's Fourth-Level Soleri Street, right?"

"That may not be necessary. Come on."

On the Ways, it occurred to him

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to wonder how she had found him.

She laughed. "I noticed those outdoor working clothes and got interested before you ran into me."

"Ran into you?"

"On the Ways. When you saw the whippoorwill. Don't you remember?"

"I remember the whippoorwill. Come to think of it, I did run into a lot of people; the cop reminded me. So that's when we met?"

"I followed you when you went dashing off, but not fast enough to get a ticket, so I never saw where it went. Anyway, your sleeve tells what you are, and you introduced yourself to other people as Flanders, so all I had to do was look you up in the Directory." She tilted her head up and eyed him.

"One of the things that interested me was that you didn't introduce yourself to me at all, you just took me for granted. I'm not used to it, but I like it better than any play. Anyway, I'm on vacation, too, so I've got nothing to lose."

"Now I place you," grinned Flanders. "What you are, I mean. You're an amateur zoologist yourself, a homologist—a student of men, that is."

At the Cloverleaf Mall, he led her briskly into Maintenance Department's head offices, missing the look she gave him when he confidently strode through Personnel-Only doors with a wave to the monitor. Once beyond the public offices where people came to complain, the department was hushed, few people visible. At his small office—Gari Burke raised her eyebrows at his name on the door—he bumped the telefax and punched "Police Department" on the visiphone.

"Information, please—inter-department cooperation," he said.

The cop at the desk looked startled, glanced down at the glowing legend, "Maintenance," that had appeared under Flanders's image, nodded, and the 'plate went milky. Seconds passed, and a trimly uniformed young woman appeared over the "Police—*info*" legend. Flanders asked for the men in charge of Wayrun Five's Fourth Level Soleri Street. Presently she gave him the number of a block station.

A red light, indicating an incoming call, had come on while he waited, and he had acknowledged it, turning it amber. The telefax had printed some two hundred sheets of plastic and was still turning them out.

A woman's face appeared in the visiplate. "There you are, Mr. Flanders!" she said. "We're moving you to a bigger office. You'll be needing a secretary, too, and we're shorthanded just now." She looked away, back. "It's down here on Wayrun level. Reports for your office have been coming in around the clock, practically, and you haven't acknowledged a one! The

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Chief kept trying to get hold of you all day yesterday. Just a minute—here he is now."

Reade Stennis's hard black features appeared, cutting in on the connection. "There you are!" he said grimly the instant he saw Flanders. "Ever since we set your office up for this investigation, reports have flooded in from all other departments. Thank God we didn't make knowledge of the office public! We may have to do that if things get much worse—it calms people to have a place to complain. The City Manager has been asking about it—even hinted that a permanent office should be set up. If *he's* ready to lay out money, things must be bad. I hope you've got something I can tell the Cabinet."

"Very little, really," Flanders said. "I've only been on it a day. I think the only way to prevent birds and insects from entering from outside would be to close all openings, except maybe for the ground-level entrances. I mean, except for highways, railways, and so on. It seems to me that the number that get in by way of transportation entrances are minuscule compared to the rest."

"That's impossible! The people'd never stand for it."

"I know. And even it wouldn't do all that much good—it wouldn't get those that are already in back out."

"I hope you can come up with something better than this," grumped the other.

He said, "I'm still trying to find out what they eat. That's their weak point. It's still incredible that animals could establish themselves on a permanent basis in a tightly-integrated arcology like this, though I have evidence enough to see how a few could survive. It's a long step from survival to a permanent niche. Oh yes—one of your office managers bawled me out for not acknowledging all these reports. I'm not even going to be able to investigate them; in fact, I no longer particularly need them. I have a plan of campaign pretty well worked out."

"We're moving you into bigger offices," said the other. "Can't spare a full-time secretary, though. It'd look better to have the offices manned at all times, but as long as there's a chance you can crack this, we'll not worry about appearances."

Gari Burke came around the desk. "Don't worry about a secretary, Mr. Stennis. I'm a trained secretary and a good one. I'll handle it. And you'll need a secretary, Gil; I don't think you realize all that a properly-equipped office can do."

"Who're you?" demanded Stennis, scowling. "Flanders, I hope you're keeping this secret."

"I never thought to," admitted Flanders mildly. "The public hardly seems on the verge of panic at the—manifestations, though.

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Mostly they seem amused. I think the idea of birds flying around the Ways pleases them. It did Gari—Miss Burke—here."

"He has been keeping it secret, Mr. Stennis. I never knew until this morning he was working for the city. Everybody thinks he's on vacation. Riding a hobby, see?"

"O.K., no harm done. But when you do have to admit you're working for us, act like we're merely properly interested, not like we're worried."

When he had gone, Gari asked, awed, "Was that *really* Reade Stennis?"

Flanders nodded.

"What's all the secrecy about?" she demanded abruptly.

Flanders explained the Maintenance director's fears of breakdown of the public's trust in the arcology and the resulting panic.

She thought that over and had reluctantly agreed to the possibility when the brisk office manager appeared to hustle them down to the new office. Flanders gathered up the scattered sheets and wiped the telefax's record—it had finished printing it off—and was ready to go. When they reached the other office, they found that the telefax there had already recorded more reports.

"Give me those, Gil, and go take a nap for an hour," said Gari, frowning intently at the office's computer and communications equipment. "It will take a while to get this programmed, but I'm really a good secretary." She began to set it up, first skimming through the reports and picking out key words.

Flanders watched for a time, as always fascinated by the exercise of a highly-trained skill, then became aware of the hollow feeling he had been automatically ignoring, and sent out for breakfast.

Gari fed the data into the computer, sighed, and stood up. "There" she said in satisfaction. "This is a pretty expensive office. It's no Valerone Integrator, but it'll answer any simple question about these reports. I've had them collated by area and type of life—birds, insects, and other—and by time of day observed. You have to be aware of the limitations of computer data processing, but within those limits it'll answer any question."

"Off-hand, I can't think what to ask it, though it knows more about the situation than I do."

"Not necessarily," she frowned. "The output is no better than the input, and all these observations were made by unqualified witnesses. Any given report contains very little hard data."

He nodded and sighed. "You ready to go down to Wayrun Five's Seventeenth Block?"

"No. We should at least ask the computer to sort out all instances of birds being observed feeding. And why go down there? Call

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them up and have 'em telefax the data to you."

Flanders opened his mouth, closed it. His work was not done in an office, and while he used ordinary office equipment as casually as anyone, he did so like any amateur, the hard way. Also, as his work required personal contact, he had formed the habit of doing everything in person.

He grinned. "I begin to see why my colleagues were so anxious to acquire a secretary-equipped desk. O.K., put the computer to the question while I grill the top cop."

Presently he was looking at a recorded view of W5 Eastbound Soleri Street, Fourth Level. Numbers gave the time as after 2330. The code for "*anomalous situation*" glowed in an opposite corner of the scene.

Hidden microphones and ikons watched every public area, but nothing was recorded without reason, partly because it invaded civil liberties, mostly because it would have filled the city-unit with record crystals in a couple of years. Spaced not too far apart in all streets, Ways, and other public areas, were blank gray plates in the walls or moving barriers, plates with Panic Buttons in the shape of blue shields. Pressing one caused it to light up in bright blue, the presser to be holographed—to prevent false alarms—all hidden mikes and ikes in the area to begin to record, and alarms to ring in the monitor's office and in the helmets of every nearby cop. The monitors could also switch them to record, and so could the beat cops.

The view was to the west. A thin endless line of standing and seated figures slid toward and under him, trickling off the street to either side. The street was virtually deserted, and most of those he saw were late party- or theater-goers, too tired to pay much attention to their surroundings.

There came a low, throaty gurgle from near the mike; a gurgle that came from no human throat. A pause, then: "Ka *weep*-oh-*wee*eow, ka *weep*-oh-*wee*ow, ka *weep*-oh *wee*ow," trailing away into, "Ka, ka, kuh-uh-uh."

The people in the street looked up, their pale faces standing out; some smiled, some shrugged. Most looked bored. Flanders had a sudden suspicion that most of them thought the sound was broadcast. Some residents had had their streets wired for music.

While the one nearby fluttered and tested its throat, another one in the distance took up the cry, the whistle echoing weirdly down the narrow street: "Wip-oh-weeow, wip-oh-weeow, wip-oh-weeow, wip-oh-weeow." At that distance, the throaty catch was not audible.

"Whippoorwills," Flanders told Gari.

Others took it up. The street seemed to ring with them, a hun-

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dred birds in full cry. Listening critically, he thought it sounded hollow, though. Maybe half a dozen of them calling. "It always sounds like there're a lot more whippoorwills than there are," he explained, "and this is in a long, narrow area."

The one near the ike took up the cry again and did not stop. The weird, endless cry, an astonishing noise to come from a bird no bigger than a pigeon, would drive a man mad, especially if he were trying to sleep. With occasional breaks to change position, it would keep it up by the hour.

Flanders grinned. It was practically his cradle song. He could sleep with one on the roof within meters of his head. "They must be in the air ducts; otherwise we should see them from so near," he observed.

"It sounds like the walls ought to be bulging with the noise," said Gari, awed.

"This record runs for three hours," said Flanders, turning it off and taking it out of the visiplate. "Feed that into the computer—whippoorwills on Wayrun Five, Fourth Level. That's near where I lost that one."

"Here's the answer to your other question," she said, handing him a sheaf of plastic sheets.

Skimming through these reports, he found five that were pretty obviously descriptions of birds feeding, another half-dozen in which birds were described as doing odd things, possibly feeding, and four in which the computer had simply made a mistake.

He pointed this out to Gari and she took the list and informed the machine of its mistake. "It's a question of feedback, sir," she told him. "I mean, Gil. The more of the computer's mistakes you correct, the less it makes. After all, while it can scan a report and note and cross-index words like 'feeding', it can't actually read them, much less understand them."

"Most of these observed feedings were in the Ways and streets," mused Flanders. "It begins to seem, more and more, that that's where they get most of their food."

"Of course, that's where most of our observers are, too," Gari said. "I mean, not many people help unload food containers at the back of restaurants, or stroll past the sewage and garbage disposal tanks."

"True." Flanders brooded. "We need expert observers on duty, but we are the only ones available. It should be possible to get some more information out of that computer, though. Let me think."

Gari rang and had the breakfast tray removed, and transcribed skimmed, and fed into the computer the half-dozen reports that had piled up on the telefax. She instructed the computer to receive, record, and feed all such incoming reports into computation. It now had enough knowledge of what its

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job was to program itself to that extent.

"Sort out all reports of sighting more than one bird," he suggested finally. "And all reports of bugs in the plural. I want to see where they are grouping."

With that sorting, a pattern began to emerge. Some birds lived in the streets and were even more common in the Ways. Others were seen in the service areas of the city—in the transport channels and container elevators, the service corridors, et cetera. Insect groupings were reported only in the latter areas.

"That means they have two sources of food," said Gari, satisfied. "Dropped food and insects. No doubt their constant patrolling keeps down bugs in the streets."

"No doubt. And since there are more birds behind the scenes than in the streets, there must be only one population of them with two food sources, not two different populations. Certainly that whippoorwill knew where it was going, though it wouldn't eat dropped food. So that takes us back to the insects. As I thought at first, they are at the bottom of the food chain. And unless I'm mistaken, Stennis's problem is insoluble. Judging by what those ants were eating, insects will be able to find food almost anywhere in the city, whereas birds and mice won't." He frowned. "That reminds me. Apparently there've been mice in the city since it was built. Rats haven't been a problem. The city's rat-proof—they can't gnaw through the walls—but mice can always find holes to get through."

"Let's check up on mice," said Gari. "I skimmed the reports, and it seems that most of our non-bird, non-insect reports concern them."

There were more mice, they discovered, than birds in the city. They were seen mostly in the service areas, but had also been spotted in the streets. And a report from the Department of Sanitation stated that when pumps and sewage/garbage first-stage filters were cleaned, drowned mice had always been found—apparently ever since the city was built. The same report stated that they were also found in the pumps and filters of the various companies that processed such waste, but they had no details on that—the companies serviced their own equipment.

"That's very suggestive," said Flanders, staring at the report. He looked at Gari. "I never guessed that the pipe systems were open to mouse penetration. Inspection ports or something, I suppose. Those pumps and filters are big things. Still, it's hard to believe. Air ducts, yes, and algae and yeast vats and tanks." He looked harassed. "It'd take a dozen investigators a month just to get an idea of where all their food comes from." He tapped the report in brooding thought.

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"And, if mice can penetrate such tight systems, insects should do five times as well."

"True." He thought a bit more, said suddenly, "Tell me, do you have much trouble with dust?"

She stared. "Dust? No. The filters take it out before the air's let into the apartment. You did mean in my apartment, didn't you? No, I never have to dust."

"I thought not. The streets and Ways are swept constantly—but it stands to reason that more dust should collect in them." He stared at her thoughtfully. "Still, there's not very much even there; the air is constantly pulled out and filtered. I only recall seeing a few places in the city where dust accumulated."

Gari nodded thoughtfully. "Why is dust important?"

"It may not be. We'll have to check personally. Let's have all reports of bug concentration." His sudden idea growing clearer, he added, "Especially in places where the air is humid."

Gari shrugged in mock resignation when he said nothing further. "We'd better leave a summary on the computer for anybody that calls asking for information," she said. "The computer can't supply it, but it should be left open so that—say—Management, Cabinet officials and above can verify specific facts. I gather the Maintenance Director wouldn't like us to leave the computer's data bank open to any caller."

After they had composed the interim report and briefly studied the reports listing concentrations of bugs, they left to begin a trek of the city's service areas. The first half-dozen places Flanders tried told him nothing; then they checked a place in a service corridor near one where a number of beetles and mice had been reported. This was part of a stub branch and contained a humidifier; the air was not uncomfortably damp, but a thin sheen of dew sometimes collected on exposed surfaces.

Back behind bundles of telecom fibers, pipes, power lines, even on monitor boxes and fan covers over the outlets, were fungi. A centipede ambled unhurriedly on its unknown errands around them. Mushrooms, toadstools, more that he recognized but did not know the names of, were there. Not so many that they would be noticed in the dim light, but obvious to a deliberate search. The Maintenance tech who had unlocked the "Restricted" door was profanely amazed at their presence. Flanders reflected that the equipment here rarely needed examining. It was not surprising that they had never been seen.

Another couple of blanks, and presently Flanders and Gari were peering at the floor of the space above one of Transportation Department's upper level container channels. Above the roof of the two-meter-high channel was a two-

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meter space between buildings that was nearly stuffed with Transport's vacuum-tube mail pipes and their booster stages, the compressed-air pipes and booster compressors for the Transport channel below, Sanitation's sewage/garbage lines, and Maintenance's water lines and power and com cables. This space, too, was an air duct, taking used air from the buildings beside it. A clear area ran down the center, but only a contortionist could negotiate it swiftly. They were on hands and knees, peering back under the various pipes and lines.

The floor was bright green.

"What *is* that stuff?" demanded Gari.

"Algae. Soil algae. I'm no . . . whatever the word is . . . but I've frequently seen it on damp ground. It looks like someone has sp lled green watercolor on the ground. The thickness of it is about that of a sheet of paper."

"It must not need much light."

"It doesn't." Flanders stood up. "There should be some on the tops of these things, too. Anywhere dust would settle and dew condense." There was, with silverfish and things like lice on it.

"The intake filters in this duct must not be as efficient as the outlet filters," remarked Gari. "This air smells musty and feels wet and dead; likely it's exhaust, simply routed down to the algae vats, or out of the city."

"True. This would be a good place for slugs," observed Flanders. "If they can eat that stuff."

By the time they had found lichens, several patches of mosses—some silvery-gray, some green and several more areas containing fungi, it was again well past noon.

While eating—afterwards, rather —Flanders said, "I haven't the foggiest idea how much of this stuff is edible by what insects, but my guess is we haven't seen the tenth part of what is there."

Gari shook her head wearily. "Who'd ever have dreamed there'd be so much icky stuff in a well-policed arcology like this?"

"No one; that's the trouble," said Flanders troubledly. "In any place that's used routinely, everything's swept and filtered till nothing of the sort could survive. The only place it can live is behind the scenes—which is just where it *won't* be discovered until it's got a foothold and is spread all over the city. Stennis needs half a dozen specialists, not just one. And a lot more time than he's willing to spend."

"It looks like you'll be spending a lot of time in the city," said Gari. She seemed to relish the idea.

The next morning they were ushered straight into Reade Stennis's office. The director had apparently made the mistake of exploring their computer's files and was now gray-faced at the extent of the problem.

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"Let's hear it," he said wearily.

Flanders said, "I'll prepare a formal report later. Right now I'll just hit the high spots. You already know how the mice, insects, and birds got into the city, of course—how they are getting in, I should say. There are, in the city, mice—but no rats, we believe—and birds, including sparrows, wrens, chickadees, and whippoorwills, and possibly others. In general, insectivorous birds. There are also at least ten species of insects in the city, including ants, two kinds of beetles, cockroaches, crickets, three kinds of moths, silverfish, and wasps. There are also numerous species of spiders. There do not seem to be any flies or gnats, or mosquitoes. Also, assorted algae, fungi, lichens, and mosses are also found in the city."

Stennis looked startled at the last

Flanders put his notebook away. Looking at him and speaking in the clipped official voice he used for permanent records, he said, "Both the birds and mice eat primarily insects. The insects, in general, eat each other, edibles readily available in the city—for instance, the natural waxes found in at least one of the city's heavy greases—and the plant types mentioned previously. The plants need only a little light, a little dust, and a little moisture to survive anywhere in the city. Even despite the most efficient possible filters, we believe, enough dust will accumulate in the odd crevices and crannies of the city to support them. Their spores are probably brought into the city and distributed by insects and birds.

"Of course," he concluded, "this is preliminary only. A full investigation would doubtless reveal many more plants and animals than this, surviving in a remarkably cohesive, parasitic ecology rooted in the city's inefficiencies, crannies, and loopholes."

Reade Stennis's hard dark features had got harder and darker as Flanders spoke. He had spent enough time in the city's bureaucracy to recognize evasion when he heard it. "It's preliminary only," he admitted grimly, "but it should be enough to give us a preliminary answer to the payoff question: How do we get rid of them?"

Flanders looked at him flatly and said: "You don't."

The other nodded, holding his eye. "But I'll have to have your reasons—for the Council," he said. Flanders hadn't realized it would go that far.

Flanders said, "Basically, it's that they have achieved a self-sufficient ecology based on material—dust, wax, access to the water-recovery and sewage reclamation equipment, and God knows what all—that is always found in the city—particularly the plants. There is no way to eradicate the plants short of extensive panlethal spraying. That, of course, would affect the city's water-recycling and organics reclama-

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tion systems, and since fertilizer is the principal product, they would enter the soil. Many of these panlethals are readily degradable, but the best ones may last for years, causing them to build up in the city's systems, with ruinous effect. Reclamation might be cut in half, and even water purification might be seriously affected.

"If the plants could be eradicated, of course, it would soon largely solve the rest of the problem. They are at the bottom of the food chain."

"What are your recommendations, then?"

"The problem should certainly be studied in detail, though we feel that a more detailed investigation would not change these conclusions. However, nothing of the sort has ever been reported before, and it should be studied while the process is underway. I may state that we do not believe the invasion of the city-unit is by any means completed. Such an investigation should involve entomologists, zoologists, and botanists specializing in thallophytes and bryophytes. How many investigators it would take, or how long, we have no way of estimating."

"Very good," said Stennis expressionlessly. "The city thanks you for your prompt and thorough response to our call for assistance, Dr. Flanders. I take particular note of the fact that while you were allowed a week, you completed your admittedly rather brief investigation in a mere two days. Your recommendations will be considered carefully, and I shall look forward to seeing your report. Consider yourself the guest of the city for the rest of your week's leave from your company—and please keep in touch with this office."

He reached out, bumped a bare spot on his desk, slumped, and said wearily, "O.K., Flanders, off the record, what the hell do we do now?"

Flanders relaxed, and Gari, sitting rigidly erect, came to her feet. "Got coffee?" she asked.

Stennis waved at a nondescript panel on the front of the room's computer and com wall. "I'm up to my ears in it," he added, and only two cups slid out of the office's print-out slot at his elbow.

Flanders was grinning at the concealed coffeemaker. He hadn't spent much time in upper-echelon offices. He said easily, "Frankly, Mr. Stennis, I don't see that you've got a problem. You assert that the real problem is panic. Many of your citizens have seen birds. Their reactions run from boredom to astonishment. A few will be irritated. Steps can be taken to prevent irritations—perhaps a transpex shield over the high-speed lanes and a way for Sanitation men to get on it with their sweepers. The streets won't need them. Perhaps pre-

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dators could be introduced—we can't say yet."

"You must have more reason than that for thinking there won't be a destructive panic."

"Miss Burke here was born and raised in the city. If you'll ask her, you'll find that breakdown is unthinkable to her. You know too much about all the work constantly needed to keep the air and water and so on moving. The Man in the Way has never heard of your Zero Defects Preventive Maintenance program, and wouldn't be interested if he did."

Gari agreed. "As long as you don't look worried, Mr. Stennis, nobody else will be—not unless half the city gets short of breath some night. Besides, we . . . they think of you as a rock, always there, no lather. You look like you could do anything."

"I've often wondered why I got this job," he muttered. "How about the snakes and yellow jackets and such?"

Flanders shrugged. "Forget 'em. Educate your city workers and the people about them, and they should cause no panic. Ignorance is fear. Even in the country, among farm workers, neither is troublesome; fatalities are virtually nonexistent. You'll certainly have far fewer both of kinds and quantity.

"As for the fungus in the filter, you *may* have to install ultraviolet sterilizers in them like those used in space. But maybe not. Your filters are the electrostatic plate type, aren't they, using a thin film of water to pull the dust out? I suspect you'll find that that one wasn't getting enough water. In any case, simply turning up the water should keep spores from lodging."

Interest kindled in Stennis's eye. "You can't just turn the water up," he said. "But," thoughtfully, "it should be possible to increase the flow. Yes. But go on."

"That's it. Something can always be done. The city won't shut down because of a few bugs, or mice. It will just get a little more complicated. They're here to stay. Evolution, as we say, is the gateway to survival, and adaptation is the key to that gate. They have adapted and are adapting. Next—given time—will come physical change—evolution."

Stennis's features were intently immobile. Once his fear of the people's fear faded, he was able to study the problem with a clear mind, and after several minutes of silence, he nodded, slowly formulating workable approaches to the most obvious of the new problems that would fall in his department.

A picture of the sloppy, unstreamlined arcology the city must become came to him then. "Are you *sure* there's nothing we can do?" he asked almost plaintively.

Flanders had sat quietly watching him, anticipating getting to know him better, pleased at the idea. He

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considered the question seriously.

"There *might* be something," he said doubtfully. Looking at the suddenly hopeful Stennis, he said slowly, "It might do quite a bit toward alleviating your problem—I intend to include it in my formal recommendations—in very careful phraseology of course."

Carefully, he asked, "Mr. Stennis, what do you think of birds?"

Surprised, Stennis asked, "Me? Uh . . . nothing. Outside, I guess they're all right. I don't get out much. You mean inside the city? I think they're a bunch of nasty noisy nuisances, of course, same as everybody else."

"In that case," said Flanders, grinning and standing up, "I suggest you learn to love them. Because, Mr. Stennis, they've learned to live with you." ■

in times to come

Next issue carries a yarn to please a good many readers—judging by the letters. James Schmitz is back with his most popular character, that pretty little teen-age witch, Telzey Amberdon. Obviously small, inoffensive and harmless, but mentally—both in the intellectual sense, and in the psi sense—something of a booby trap for the unwary.

But . . . in "The Telzey Toy," she's up against someone who was anything but unwary, someone who had a technique to paralyze all her psi powers and, moreover, rob her even of her identity.

Of course that left only one way for her to escape the trap . . .

There is, also, an article in which you readers are being asked to contribute suggestions to solve some real, real-world problems. There's a great need—as always!—for new techniques of applied science in law enforcement. It includes, incidentally, photographic proof of something I'd never believed in—a man who has no fingerprints whatever! A most startling picture!

THE EDITOR

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forever enemy

The philosopher's ideal of Sanity
tends to lack one factor—
a factor which by its very nature
is never pleasing
to the philosopher . . .

HOWARD L. MYERS
Illustrated by Vincent di Fate

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Renson broke warp a proper five million miles from Nexal. The radiation of the planet's Sol-class sun felt pleasantly warm on his exposed face, chest and limbs, and momentarily opaqued his eyeball shields until he turned his head away from the glare.

The shields cleared immediately, and he had no trouble spotting the gleaming disk of the planet, the capital world of the Lontastan Federation. He went full-inert and promptly streaked toward the planet, feeling a touch of satisfaction with his astrogational skill. His warp-exit coordinates had placed him where his inert momentum would carry him precisely to his destination.

He tongued his toothmike and messaged: "Calling Nexal Arrivals Control. This is Fait Linler of Stemmons arriving with due prior notification. E.T.A. two hours. Please ack."

The acknowledgment was slow in coming. Rensin was beginning to frown uneasily before the response rang in his right ear:

"Linler of Stemmons, this is Nexal Arrivals. Maintain inertia. You will be escorted down."

"Escorted?" Renson demanded, surprised. "I really don't see the necessity of—"

"Maintain inertia!" the voice interrupted. "Nexal Arrivals out!"

"But . . ."

He did not complete his protest. This business of an escort had to mean that, for some reason, the Lontastans were suspicious. Had he given himself away with a false move?

He was—technically speaking—an enemy here, even though he had no intention of causing, or seeking, trouble. However, if trouble waited, his best bet was to warp out while he had the opportunity.

He went semi-inert, preparatory to setting a warp vector, then was stopped by a thought.

Why had Arrivals Control *told* him he would be escorted? Why hadn't the escort simply arrived and surrounded him? Was he being baited into a guilt-revealing action? What should . . .

The hesitation probably saved his life. Zerburst terminals flared suddenly in scorching brilliance on every side, bottling him at a distance of only hundreds of miles in an almost unbroken shell of death. As it was, his skin-field went total-reflect to block out the fierce radiation. If he had tried to vector in any direction, one of those terminals would almost certainly have caught him.

A harsh voice barked in his ear: *"Fait Linler! Go inert and STAY inert!"*

Renson obeyed.

Within seconds the escort of Nexali Guardsmen closed in on him. He watched expressionlessly as they spiraled around. They were a tough-looking squad—doubtless barbarian types of the sort usually

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found performing such duties. With their zerburst guns held in alert readiness, their black shorts and their overpolished boots, they looked very military and very murderous.

In short, a goon squad—one of the uglier features of the endless Primgranese-Lontastan war. As long as human society had a use for such barbs as these, Renson mused grimly, their genetic strain would remain intact.

"Take off your belt and throw it!" ordered the harsh-voiced Guard officer who had spoken before.

Renson did so, not bothering to protest that his belt contained no weapons. A Guardsman snagged the belt as it drifted away and examined it cautiously.

Then Renson's sight was cut off. The escort had thrown a blindfield around him. He would see nothing during the rest of his journey to Nexal.

Time passed. When they entered the lower atmosphere he knew of it only from the relaxation of his pressor field and from the change of his breathing mode. The sensors of his life-support system, having detected suitable air around him, automatically deactivated the gas-conversion macromolecules in the linings of his throat and nasal passages, and he went on external respiration. What sounds filtered through the blindfield were muffled and uninformative.

When the field lifted Renson saw he was in a small windowless room. He had been left carrying sufficient momentum to slam him backwards into a chair, in which he was immediately confined by a restrainer belt across his stomach.

After a dazed instant he saw the escort was gone. Only one other man was in the room, facing him across a desk.

"I'm Arkay Delton of Anti-Espionage," the man informed him mildly. "Who are you?"

"I'm Fait Linler, from Stemmons," replied Renson. "Look, what's all this about?"

Delton's eyes had lowered to something Renson could not see on the desktop. Now he looked up and repeated, "Who are you?"

Renson blinked. Obviously Delton had an emo-monitor focused on him, and his use of a false name had registered; else Delton would not have repeated the question. Renson had lived with his assumed name, Fait Linler, for five years, and had hoped that, if he were ever emo-monitored, it would register clean. Plainly, it had not.

I AM Fait Linler, he assured himself. *That's my real identity. Grap Renson is no longer real. I accept that as true without reservation.*

But in reply to Delton's question he said, "Nobody you need concern yourself about. I'm not a spy, nor an enemy."

Delton glanced up and said,

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"Thank you," which probably meant the answer registered clean. "Who are you?"

Annoyed, Renson replied, "Fait Linler."

"Who are you?"

"Fait Linler, of Stemmons."

"Who are you?"

Renson consciously relaxed himself. This interrogation setup—a mild, friendly-faced man repeating a question at him from across a desk—had a strong and intentional resemblance to a psych-release therapy session. Psych-release was a major landmark in the life of every child, opening the way to a sane adulthood.

Thus, the temptation was to regard Delton as a therapist and cooperate fully.

Renson wriggled under the restrainer belt into a more erect position. "Fait Linler," he said.

"Who are you?"

"Look, I told you I'm nobody of concern to you! I'm not a participant in the econo-war at all! In fact, my sole purpose for coming to Nexal is to try to discover why this nonsensical war exists in the first place!"

Delton considered this outburst a moment before saying, "Thank you. Who are you?"

"Fait Linler!"

"Who are you?"

"Fait Linler."

"Who are you?"

The repetition of question and answer went on for half an hour . . . and Renson was beginning to think it could continue forever. Delton would tire, and be replaced by another interrogator, who would tire and be replaced by—

It was futile to go on.

"Who are you?"

Renson sighed. "I've been Fait Linler for five years. Who I was before that isn't important."

Delton smiled. "Thank you. Who were you six years ago?"

"It doesn't matter."

"Who were you six years ago?"

After a pause Renson shrugged. "I was Grap Renson, an engineer with Sol-Veg Systems Corporation, in the Commonality of Primgran."

"Thank you, Mr. Renson. What grade engineer?"

"Junior first."

Delton looked impressed. "And you're not here as a spy or a saboteur, or otherwise as an agent of the Commonality or of a Commonality enterprise?"

"No."

"But you are not here as a defector, either?"

"That's correct," Renson said stiffly.

"Thank you." Delton shifted slightly in his seat for the first time. "After your long trip from Stemmons you're probably ready for some bulk food."

Renson nodded.

A tray slid out of the wall to pose a breakfast over his lap. He dug in with good appetite. During warpflight it was necessary to sub-

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sist on food-concentrate pills, with a stomach-balloon countering the empty sensation the pills left. This prevented severe pangs, but the human body had other means of recognizing hunger. And that, Renson realized as he grew more comfortable, was one reason why he had found the idea of a prolonged interrogation so hard to face.

He looked up between mouthfuls. "What alerted your security to me?" he asked

Delton shrugged and grinned. "Several things. It seemed likely, when I first read the query on you from Arrivals Control, that you were either a rank amateur at infiltration, or that some Primgranese spy-boss was taking a shot in the dark with an utterly naïve approach." He chuckled, "It was foolish of you to expect that a mere five-year record of residence on a low-security planet like Stemmons—where nothing of economic significance is going on—would lead to your unquestioned acceptance as a first-class Lontastan citizen. Notification of arrivals on Nexal are always checked out, and yours was obviously fishy."

Annoyed, Renson snapped, "O.K., so infiltration isn't my line!"

"That's for sure," laughed Delton, studying the captive thoughtfully. "So you came here trying to discover the cause of the econo-war, huh?"

"Yes."

"Which means you don't accept the reasons everybody else does."

"I definitely do not."

"Why?"

"Because I find them absurd! Look, Delton, are all the adults of the Primgran Commonality and the Lontastan Federation sane?"

Delton grinned. "Those of the Federation are. I can't vouch for the citizens on your side."

"Please be serious," Renson snapped. "Humanity *is* sane, to the last adult on the most out-of-the-way frontier world. We've been sane for nearly a thousand years now. Nobody is driven by some neurotic compulsion to accumulate more wealth than he has any imaginable use for, while leaving someone else in economic distress in the process. Only insanity, on the pandemic scale of the Earth-Only ages, can justify that dog-eat-dog method of wealth distribution.

"Yet, we still go at it tooth and claw, without the tiniest neurosis for an excuse! And the big war between the Commonality and the Federation is just another level of the billions of little wars going on constantly within our ranks. Sol-Veg Systems Corporation versus Philips Interstel, as well as versus Nexxtauri General. And me, while I worked for Sol-Veg, versus several dozen other hard-climbing first-junior engineers. On every level, the organization of both our nations seems to have no other purpose than to provide a battleground!

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"Is that what society is for, Delton?" he went on angrily. "Is that the highest purpose we can grasp after all these centuries of sanity?"

Renson ran down suddenly and sat in glum silence, annoyed with himself for expressing his feelings so openly to a man he could hardly expect to understand or appreciate them.

"It could be worse," Delton remarked lightly. "It could be a shooting war, in the old Earth-Only style, instead of economic combat. So you must admit we've gained *something* from our sanity, Renson."

"We've gained precious little!" Renson flared. "There's nothing pretty about industrial espionage and sabotage, or economic oppression of the weak by the strong, or trigger-happy goon squads such as that escort that brought me here! Just because our war involves no wholesale slaughter everyone seems to think it isn't really damaging, or deadly. The obvious truth is that it is deadly indeed to the human spirit! It pits man against man! It makes us enemies when we could—and should—be friends."

Delton smiled. "You and I, for instance?"

"Certainly! Under more favorable circumstances—" Renson's voice trailed off uncertainly.

"Ah, yes, more favorable circumstances," Delton chuckled. "If we were friends instead of enemies, we could enjoy each other's company, discuss our innermost feelings and beliefs, perhaps have an argument as close friends do about some belief on which we didn't agree. *Just as we're doing right now, Renson.*"

"O.K.," Renson nodded, "I'll grant that point. You and I, technically enemies brought face to face, are conversing like friends. But that's precisely what I'm getting at—sane men *are* friends when face to face, when their proximity crowds out the artificial barriers our social structure normally raises between them. Friendship is *natural*, enmity is not."

"Friendship wouldn't be natural if both of us were hungry and only one of us had a little food," Delton dissented.

"But there's no shortage of food in our society," Renson retorted, "except for artificial shortages created by the artificialities of the econo-war! We produce a constantly increasing plenty of everything for everybody! That's another reason why the war is inexcusable. We have too much wealth for it to be worth fighting over."

Delton considered that in silence for a moment. Then he said, "Man has always been a player of games, Renson. If you're a student of history, you probably know that one of the key steps in our progress toward sanity was the recognition that life itself is best understood as

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a game. We need the same things for a good life as we do for a good game—that is, we need freedoms, barriers, and goals. And, of course, a playing field for these things and ourselves.

"But for a really top-notch game, Renson, we need something else—*teams*. The better balanced the teams are, the more absorbing the game.

"That's what the econo-war gives us, Renson, a superb and unifying game, with well-balanced teams. The play gets rough sometimes, especially for the goon squads, infiltrators, and others who choose to play in exposed positions. But there has to be hard play if the game is taken seriously as the basic game of our society.

"So there's nothing artificial or phony about the war, Renson. It isn't something dreamed up and kept going by a handful of government and industrial officials. If you convinced the top brass of the Commonality and the Federation that the war should be ended, and they signed a treaty tomorrow, within a month I bet the war would be starting again! Man *needs* his games, Renson, the same as he needs food, shelter, sex, and life-support. And this econo-war is a great game—otherwise it wouldn't still be going strong after more than three centuries."

Renson said sourly, "I doubt if the economically deprived consider it such a great game."

Delton shrugged, "There has to be losers as well as winners. To quote a bit of ancient wisdom, 'the poor we will always have with us.' " He frowned thoughtfully and asked, "Could that be your trouble, Renson? Are you soured on the econo-war game because you're a loser?"

Renson shook his head. "I was doing very well with Sol-Veg. It was my own decision to quit."

"Are you a married—or formerly married—man with a family somewhere in the Commonality?"

"No . . . I never got around to that. Never found a girl with whom I hit it off just right."

Delton nodded slowly, and Renson wondered why Delton had asked about his marital status. But he said nothing, because he could see no point in continuing the discussion. Evidently Delton felt the same.

"That's all the questions for now, Renson," he said. "Behind you is a door into an apartment where you'll be comfortable while you wait for the disposition of your case."

The restraining belt dropped from Renson's lap and he stood. He wanted to ask what the Federation officials were likely to do with him, but he knew Delton could not answer that. "Thank you," he said, and left the interrogation room.

During the next two weeks Renson had plenty of solitude in which

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to consider his situation. And he reached the conclusion that entering Federation territory had been pure folly—a waste of five years.

It was not that his capture was preventing him from gathering data on the cause of the econo-war. The truth was that Nexal, or any other Federation planet, had no data to offer that was not available on any Commonality world. In all essences, the Federation and the Commonality were the same. They were twin societies, operating on the same principles and with the same motives.

And, of course, the Federation's ideas about the war had to duplicate those he had been hearing all his life at home . . . the same glib answers, such as Delton's life-game analogy, which made a certain amount of sense but failed to explain why man, with all his abilities of creative imagination, had not come up with a far more desirable game for himself than econo-war.

For the first centuries of interstellar travel, a game of conquer-the-universe had been plenty, for instance. And that game was still going on, but it had lost its early excitement. It was too easy, Renson mused. The galaxy offered more room for expansion than man could use for several millennia—and so far man had found no competitor for that room, no alien species to fight.

So he fought himself. That was the explanation for the econo-war, perhaps, but it was no explanation at all. Not for a sane humanity, in Renson's opinion.

He was uncomfortably aware that his opinion was not widely shared. Hardly anybody bothered to question the assumptions that he found so flimsy. In fact, most people with whom he had argued about the war had responded much as Delton had . . . as if they could see and understand some vital point to which he was blind. Was he a prime example of stubborn stupidity, insisting on his rightness and the wrongness of everybody else?

Well, not quite everybody else. After all, there was the Halstayne Independency—a nation far smaller than either the Commonality or the Federation, admittedly—that took no part in the econo-war and seemed to get along quite comfortably nevertheless. The one Halstaynian he had met had shared fully his distaste for and puzzlement over the Primgranese-Lontastan conflict.

His meditations along such lines were interrupted a few times for additional interrogation by his captors, but most of the questioning was perfunctory. Having been away from Sol-Veg for five years, his knowledge of the corporation's activities was thoroughly dated. Also, despite his junior-first ranking, he never had been let in on any of the company's high-security projects. (An indication, he won-

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dered, that the company had considered him a questionable risk?) In any event, he could tell the Lontastans little of value.

Finally he recognized Arkay Delton's voice speaking from the call box. "Renson?"

"Yes?"

"You're to be released, with the understanding that you will not remain within Federation territory. Accepted?"

"Yes," he replied, wondering. *Released? Just like that?* "Is this an exchange of captured personnel?" he asked.

"No, the next scheduled exchange is six months away. And there could be complications if we tried to include you in an exchange. Shall we send out an arrival notification for you?"

Renson grimaced slightly at the insulting truth of Delton's words. The Commonality would not care in the least if he were never released, with his war-critical attitude, and would not be interested in accepting him for a captive Lontastan.

He answered Delton's question: "Notify Bernswa in the Halstayne Independency."

"Sounds like a wise choice for you, Renson," Delton approved. "There you'll be out of the war entirely. Check your life-support and we'll send you on your way."

"Right."

Renson went in the bathroom, stripped, got the life-support meter out of the cabinet, and began testing. He pressed the sensor platelet into the hollow under his ribs on his right side, and saw that the powerpack implant in that location still had a .7 energy capacity, which was quite sufficient. Moving the sensor above his right hip he assured himself that the mutifield packet imbedded there was in total working order. A similar check above his left hip verified the functionability of his transport packet.

Then he pressed the platelet against his closed lips, tongued his toothmike, hummed softly, and watched the needle respond. Finally he placed the sensor behind each ear in turn, tapped the soundkey, and heard the clear blips.

This checked out all the major implants. And the macromolecule sized segments of his life-support, such as those used for gas conversion in the space-respiration system, and the purely mechanical units such as the stomach balloon—these things had to be working right, or he would be feeling sick.

He dressed, stepped out of the bathroom, and blinked when he found three Guardsmen waiting for him. One handed him his belt which he put on automatically.

Then he was blindfolded, escorted out of spying range of Nexal, and sent on his way.

Out of the dozen developed planets in the Halstayne Independency,

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Renson had picked Bernswa because that was the home world of the only Halstaynian he knew.

The Independency was in a dusty area of the galactic arm, which accounted in part for its autonomy. Warping through dust was not an impossibility, but the prime-field turbulence that resulted was mind-wracking and dangerous. Clear lanes through the dust were eventually found, but their circuitousness kept the Halstayne region from having much appeal for either of the two superpowers. As a result, the Independency was formed and settled in large part by persons who had opted out of the developing Primgran-Lontasta conflict. It was a pocket of peace, bordered by both of its larger, more contentious neighbors.

Renson made a careful zigzag of warps along one of the clear lanes. Finally through the worst of the dust, he paused in normal space and looked around. The teeming suns of the galaxy were totally obscured. Only fifty-some points of light were scattered sparsely across the blackness—the suns of the Independency—and several of these wore fuzzy halos of dust and gas.

But the sun of Bernswa sparkled unobscured, and he warped for it. After breaking warp near the planet and clearing his arrival, he messaged Estine Cauval, not knowing what to expect.

It turned out that she was not only at home but in a position—and with the inclination—to be hospitable.

"Sure, come on down, Grap!" she exclaimed eagerly. "I'll switch on my beacon for you!"

"I won't be intruding?"

"Not at all. Oh, I was married for a while after I last saw you, but now everything is casual and simple. Don't forget, Grap, it's been over eight years!"

"Yes. Still a newsgirl?"

"Oh, yes, but not so pushy about it now. I haven't been outside covering the econo-war for years and years!"

"I'll be down in forty minutes," he told her.

Bernswa had several hundred semicities, but Estine did not live in one of these. Her house stood isolated in a richly forested piedmont. This puzzled Renson after a few minutes with her, because he could tell she was still the lover of crowds and swirling activity he had remembered.

"I'm writing a drama," she explained, "and need the isolation of a place like this."

"A drama?"

"Didn't I ever tell you? Dramaturgy has always been my dream. I still do occasional news features but I give most of my working time to my play. I've been at it for over a year."

Renson nodded slowly. Estine was bright, clever, charming . . . but a playwright? That hardly seemed likely. She was too much a

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reporter, too intrigued by the event to pay much heed to the meanings behind the event. He doubted if she could create a play worth watching.

"Tell me about yourself, Grap," she demanded gaily. "What brings you here?"

He sat down beside her and described his fruitless efforts to learn why the econo-war existed.

"Welcome to the fold!" she exclaimed. "You won't find an answer here, but at least you're among people who share your puzzlement. About the only sensible thing to say about the econo-war is that it's ridiculous!"

"Which begs the question," Renson remarked glumly.

"Yes, but what else is there to say? The society, as well as the individual, of the Independency is *sane*. It *has* to appear nonsensical to us that the rest of humanity finds warfare a normal and *desirable* condition of life. It's all so frantic and foolish."

He grinned. "You seemed to enjoy it when you were a correspondent."

"Oh, sure, as a reporter," Estine said with a toss of her head. "Life in the Commonality has a crazy excitement that was fun to write about, and to watch for a while. It's . . . well . . . have you ever tried writing, Grap?"

"Not the kind of writing you mean—just engineering specs and so on. I've thought if I could solve the mystery of the econo-war, I'd write something about that."

"Yes, but that's not what I mean. I mean poetry, or fiction, or drama. What is called creative writing. Grap, it's next to *impossible* to write creatively, and interestingly, about sane people doing sane things!"

Renson thought this over, and finally nodded. "I can see how it would be," he agreed. "If everybody is sane and reasonable, you don't get much dramatic conflict."

"That's it, exactly," she said. "And that's why I enjoyed covering the econo-war. It's also why modern novelists do historical pieces about Earth-Only days, or else fantasies. I'm not saying sanity is *dull*," she giggled, "only that it makes dull fiction compared to Dickens, or Tolstoy."

"And there is some fiction about the econo-war," Renson put in, wondering why Estine had sounded defensive when she denied that sanity was dull. "Which may be roundabout evidence that the econo-war is as anachronistic as Uriah Heap."

She smiled and grasped his hand. "I sensed that you felt that way when I first met you, Grap. That was one of the things that attracted me to you. And now . . . welcome to our non-fictionalized society."

"Thanks. Hope I'll fit in."

"Oh, you will," she said with assurance.

A few days later he went to talk

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to Ferd Primlay about a job. Primlay was development director of Halstayne United Life-Support Corporation, largest producer of life-support equipment in the Independency.

"I've not been active in the field for five years," Renson said apologetically after they had talked for a while, "and that may put me a bit out-of-date."

"Not at all!" glowed Primlay. "You may, uh, even find you're ahead of us in some respects. We do tend to lag behind Commonality and Federation companies at times, with them always scrambling for some minor competitive advantage. Although I must say we do all right, considering our size and position."

Renson nodded. It was all a matter, he thought fleetingly, of what one considered "all right" to be. The Halstaynian version of the multifield packet was a cumbersome object, nearly two cubic inches in volume and about sixty years out-of-date by Commonality standards. He had noticed that Estine's packet actually made a visible lump under her skin when she bent a certain way.

"Perhaps I can help you overcome some of those lags," he said. "Also, there's an idea I had on the way here. Why not include an emo-monitor in standard life-support equipment?"

"Hm-m-m. An interesting thought," said Primlay. "I wonder, though, if an emo-monitor wouldn't be getting us too far away from the basic definition of 'life-support'?"

"I think not. The definition has got broader over the centuries. Life-support originally meant providing a livable environment for a man in space, either within a ship, or in protective clothing. In essence, it meant air and temperature control. Provisions for propulsion and communication were called by other names. That distinction was eliminated as it became possible to equip a man for spaceflight without recourse to ships or special clothing. And, after all, motion and communication are as fundamental to life as breathing and maintaining internal pressure, if somewhat less immediately so. An emo-monitor would seem a logical addition to the communication capabilities of life-support."

Primlay nodded gravely. "It would, of course, require extensive research. I can see the advantages. A man wants to understand his woman, a parent wants to understand his child, and so on. Personal relationships would be improved if we could 'read' each other's feelings."

"It could all but eliminate deceit, including self-deceit," said Renson.

"Yes." Primlay squinted in concentration. "Let's keep that idea in mind, Renson, and we'll discuss it further in a few months. You understand such a proposal isn't one

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to jump at without thorough consideration, and there's something else I'd like to get you onto first."

"Then you're hiring me?"

"Of course! All applicants are hired here. Didn't you know? That's basic to the Halstaynian way of life."

Renson blinked. He remembered reading something to that effect long ago, but he hadn't really believed it, thinking it one of those rules honored more in the breaching than the keeping. But, if the Independency was actually free of economic competition, such a rule was probably necessary.

Primlay was watching his expression. "I suppose your former colleagues wouldn't consider that a practical personnel policy," he remarked stiffly.

"They wouldn't," agreed Renson with a slight grin. "But they cling to many things dating from presanity times. What is it you want me to work on?"

Mollified, Primlay said, "Stomach discomfort, especially in older people. Our balloon apparently does not work as well as the Commonality version."

"If the balloon's outer surface is sufficiently random-transportive," Renson said, "there shouldn't be any discomfort."

"Random-transportive," murmured Primlay, not quite making it a question.

"You may have another term for it," said Renson. "The idea is that the balloon shouldn't block pill nourishment away from any portion of the stomach's wall, otherwise a person gets localized pangs. It's mainly a design job, involving the distribution of microtublets in the self-flexing substance of the balloon, with the distribution ordered to provide maximum pressure in areas of maximum resistance."

Primlay nodded. "This is something you're familiar with?"

"Yes."

"Fine! That will be your first assignment. Now, I understand from your friend Estine Cauval that you're quite a vactennis player, Grap."

"Yes, but I'm a bit out of practice now."

"It's my game, too," said Primlay, in a livelier tone than he had used before. "In fact, that's what first roused my interest in life-support systems. A player's game is no better than his equipment, you know. Perhaps we could have a game . . . ?"

"Sure," agreed Renson. "Let me know when you have time."

"No time like the present," laughed Primlay. "Come on!" he leaped eagerly from his seat, strode to the window and dived out. "Let's go!" his fading voice trailed back.

Renson stood motionless for an instant, then grinned and dived after his new employer. Maybe, he guessed, it was part of the rules in

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the Independency that a man in Primlay's position could play hooky from his job if he liked.

He followed the man up into space and the two of them enjoyed an afternoon of strenuous sport. The Independency, Renson was thinking, was a great place to live.

He spent the next three months changing his mind.

The stomach balloon assignment had not struck him as a major challenge, but more as a preliminary test to assure Primlay that he could deliver. It involved nothing more than was already being done by Commonality and Federation manufacturers, using materials and processes Renson knew well. For that matter, samples of modern stomach balloons from outside were easily available for copying, although at a higher price than many Independency citizens could afford.

He had expected to be through with the project within a month at most. But that length of time found him barely started.

He told Primlay, "I would like to do some shifting about of the personnel on the project. Random-transportive design is a finicky task, in which a minor error by one drafter throws out the work of a whole drafting team. And . . . well . . . some drafters are less talented than others."

"That's very true," nodded Primlay. "However, shifting people about isn't easy. What did you have in mind?"

"Anything that would give me a first-rate drafting team—even a small one. For instance, the less useful drafters could be put on other jobs within the project—"

"Not unless they ask for it without prompting," said Primlay. "The key point there is that these people accepted employment with our company as drafters. As long as they're satisfied with the work they're doing—"

"O.K.," said Renson, "let's take them off the project entirely. Assign them elsewhere in the company."

Primlay smiled. "That wouldn't be exactly fair to our other projects, would it? I assure you, Grap, your project has no more than its share of less useful workers in any category."

"Well, look," Renson snapped, "these people are a drag on our progress! What can be done about it?"

"The best thing to do," laughed Primlay, "is to relax. There's no great rush. Actually, your project is coming along excellently, Grap. Not as fast as such things go in the Commonality, perhaps, but remember there's no war on here. Now, how about vactennis this afternoon?"

After that Renson decided not to bother mentioning his other personnel problem to Primlay: absenteeism. After all, Primlay him-

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self was a heavy offender on that score.

So the project's difficulties boiled down to those overlapping problems—at least a third of the personnel were "losers," people who lacked the ability, or the motivation, to do efficient work. And the entire staff, losers as well as winners, came and went from the lab as they chose. The recommended workday was six hours, but that was treated very loosely as a maximum. There seemed to be no minimum.

Renson tried to acclimate himself to these working conditions. After all, they were absurd only from the viewpoint of a high-competition society, or a society in which the absence of sanity made such a free and easy approach totally unworkable.

And there was no equalitarian nonsense involved in the Independency's way of life, no pretense that everybody had equal intelligence and ability. The system merely insisted that the person of less ability be allowed to make what contribution he could, in whatever way he chose, to the society's progress. That hardly seemed too much to allow.

And aside from all that, the people at the lab, and others he met socially as the weeks passed, were obviously and genuinely *grateful* to Renson for joining them, and working to bring their life-support systems closer to outside standards. It was good to be appreciated, he discovered.

So he hung on, and ignored as best he could the growing sense of frustration he felt with the crawling pace of his project.

"The thing is, it's such a *simple* task," he complained to Estine one evening, "to merely redesign the stomach balloon. I don't know what the lab would do with a really *tough* development problem, like my idea of adding a miniaturized emo-monitor to the standard system. They would probably stretch that one out over several lifetimes! No wonder Primlay's interest in it was so mild."

She grinned at him. "Don't you know we don't have a war on, Grap?"

"Yes, I know that," he chuckled sorely. "I've heard about it from several people, several times. But I still find it a poor excuse for total inefficiency."

"But it's *not* inefficiency, Grap!" she protested. "It's just the sane, comfortable way of doing things. You don't find anyone taking a *negative* attitude toward his work, do you?"

"Not actively negative, but—"

"O.K., then. Everybody on your team is interested in the work. But they're also interested in other matters of importance in their lives as individuals. Society is to serve the individual, Grap, not the other way around. People shouldn't have to

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behave like selfless machines, you know."

For a minute Renson sat gazing vacantly into the distance. Then he sighed, "I can't help but wonder, though, what kind of future the Independency is making for itself. It's not even trying to keep abreast, economically and technologically, with the Commonality and the Federation, and is falling farther behind every decade."

"We *are* trying to keep abreast," said Estine, "but we insist on doing it within the framework of our own way of life."

Renson chuckled. "So I've noticed. That means nobody works very hard, and no penalty is put on failure to do good work for the society. You *can't* keep abreast as long as your way of life boils down to that."

"Maybe not," she said good-naturedly, "but here's an old saying I just made up: The vegetation on the other side of the fence includes sour grapes as well as greener grass. In other words, we won't discard our way of life for fancier life-support packets."

"It's not just that, I'm afraid," Renson said slowly. "When failure isn't penalized—" He let the thought trail off.

"Go on," she prompted.

"Well, I don't want to belittle the people here, Estine, but it seems to me, from what I've seen in the lab, that the population already includes a large percentage of what we'd call 'losers' in the Commonality. This is a point I hadn't given much thought to until right now, in questioning the econo-war. But the one positive gain that comes out of combat is the culling of the species, the removal of undesirable strains from the gene pool, by killing off low-survival types before they have a chance to breed."

"But the econo-war doesn't even do that," smiled Estine. "Not enough people get killed in it for that."

"But killing isn't necessary when the persons being culled are sane," he said impatiently. "A loser in the Commonality, or the Federation, knows who he is, and so does everybody else. A loser is far less likely than a winner to find a desirable mate, and he's less likely to reproduce. That keeps the freakish types down to a minimum."

"I don't see that," she objected, "sane or insane, a person's strongest motivation is concerned with himself, the individual. After that, his second strongest drive is to have a family. The needs of his society to keep down the number of freaks runs a poor third."

"Yes, and it is to keep that third from being so poor that the econo-war is being fought!" yelled Renson, jumping to his feet and pacing the floor, more excited than he could recall ever being before. "It all fits together, Estine! The econo-war culls, and it provides unifica-

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tion of motivation for economic and technological advancement! I suppose I had to see your society with my own eyes before I could really understand that. Sometimes I think I'm not very bright."

After a long silence, she asked softly, "What are you going to do?"

"I'm not sure. I'm thinking of going back. I'd like to work on my emo-monitor idea with some company like Sol-Veg, and perhaps write up my ideas about the econo-war, now that they're becoming clear. I had such a hard time understanding it, maybe I would know how to explain it to people who are as dense as I've been." He turned to her suddenly. "Do you think you would like living in the Commonality, Estine?"

"No," she said flatly.

"I'm sorry. You know how I feel about you. Besides, you're too intelligent and capable not to have several children. Stay here if you must, Estine, but I do hope you'll marry again, and have lots of kids next time. Don't let this noncompetitive society cull you, girl!"

"Like the Commonality has almost culled you?" she asked thoughtfully.

Renson looked startled, then angry. "Damned if it didn't!" he said in wonder. "As if idealism was the sign of a loser! Well, I won't stand for that! I'm going home, Estine."

"O.K. It's been fun, Grap." She walked outside with him as he fingered the food pill pouch on his belt to make sure he had an ample supply.

"And for me," he said. "But the war will be fun, too. A good fight always is."

He kissed her, stepped back, and soared off into the black sky. ■

THE ANALYTICAL LABORATORY

PLACE	TITLE	AUTHOR	POINTS
JULY 1970			
1.	Star Light (Pt. 2)	*Hal Clement*	1.95
2.	Per Stratagem	*Robert Chilson*	2.50
3.	Beau Farcson Regrets	*Jack Wodhams*	3.04
4.	Ark IV	*Jackson Burrows*	3.56
5.	Rare Events	*D. A. L. Hughes*	3.86
AUGUST 1970			
1.	Star Light (Pt. 3)	*Hal Clement*	2.00
2.	Brillo	*Ben Bova and Harlan Ellison*	2.64
3.	Meet a Crazy Lady	*W. Macfarlane*	2.91
" tie	Heavy Thinker	*Howard L. Myers*	"
4.	Excelsior!	*Robert Chilson*	3.91

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manufacturing in space

Near-impossible things can be done easily where gravity, gas pressure and temperature all—or any chosen one—approach zero. Basketball size diamonds? Perfectly spherical ball bearings? Given a manufacturing plant in orbit, it'll be easy!

by Joseph Green

Several thousand years ago some forgotten genius mixed copper and tin to make the first bronze, and eventually foundries over much of the Near East were producing swords and tools in quantity. From that day to this manufacturing has been one of the prime methods by which Man has extended his control of the world, in the process providing himself with the goods and services that make life more certain and pleasant. But all men, from that first forgotten smith to the controllers of today's automated production lines, have worked within the environment in which they found themselves. The basics were so set, so "natural," that they were accepted as readily as a fish accepts the water in which it swims. The ocean of air we live in went unnoticed unless an individual had a breathing problem, or the wind blew. Gravity, whether or not recognized and identified, was always present. Yet neither basic was as firm as it appeared.

The fact that the fluid called air could be excluded from a process was recognized by Torricelli, who discovered the vacuum principle three hundred years ago. His experiments made the Industrial Revolution possible, leading directly to the invention of the steam engine

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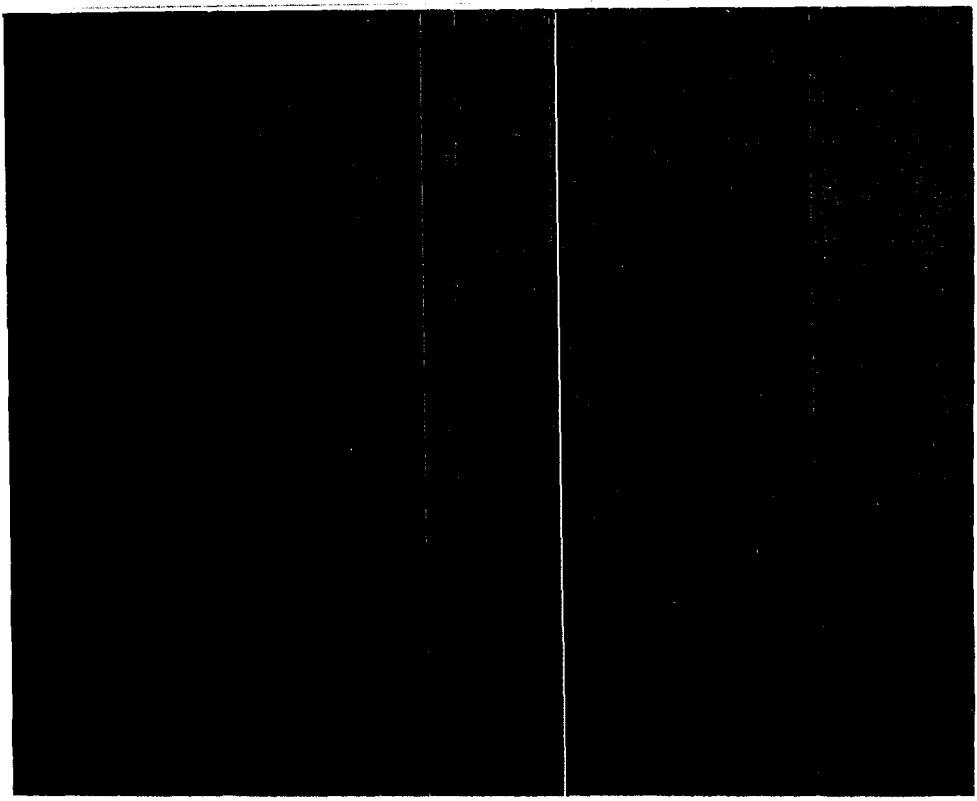

and eventually the vacuum tube and the present Machine Age.[1] In late medieval times munitions makers formed round balls by pouring melted lead through a screen in a tower. While the roughly measured droplets were in free fall surface tension was stronger than air resistance or the minor pull of gravity, and each drop flowed into a spherical shape. At ground level they struck pans of oil and were instantly cooled and hardened. Gravity had been neutralized for a few precious seconds, with highly beneficial results.

Torricelli's discovery and the first crude use of surface tension as a forming agent in the making of bullets were probably derived from empirical observation, not theories of air pressure and gravitation. Both endured because they had an excellent justification; they worked. Today a large number of advance planners are proposing sensible, practical methods for manufacturing articles in space, where the absence of gravity provides an unique environment. And it seems probable that Man again stands on the brink of a new phase in technology, and the changes sure to come may be as profound as those caused by the utilization of the vacuum principle in the past.

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The processes for manufacturing in zero-G have been worked out for many items, and the number of papers published grows almost daily. The real problems are not in the concepts but the required tooling, the key to practical application. What is the best method to control the movement of a liquid in zero-G? How do you prevent the formation of voids and eliminate gas bubbles when heating a substance where there is no tendency for the bubbles to "rise" to the surface? The solutions to such problems can be found only when ingrained habits of thinking are reexamined, when every item is considered as an unique problem disassociated from terrestrial methods for finding an answer. Space manufacturing must be designed to take advantage of the zero-G environment, not fight it in an attempt to restore Earth-normal conditions.[2]

Manufacturing in America rests primarily in the hands of hardheaded businessmen; any product which can be produced more cheaply on Earth will be made on the ground. With transportation costs into and safely back from orbit as high as they are, few products qualify for space manufacture. But the National Aeronautics and Space Administration has announced plans to build a permanent orbiting space station, and a reusable shuttlecraft that will go to and from the orbiter. When these become operational the cost of putting a pound in orbit will drop from its present figure of about $500 to $50 a pound or less, and the larger and more efficient shuttles to come in the future will reduce it still further.

What products can be made more cheaply, better, or only in zero-G? One of the cornerstones of modern industry is the simple ball bearing. A major improvement in ball-bearing technology is the hollow ball. The loss of strength is minimal, and the reduction in mass greatly decreases wear in bearings that circle in raceways at high speeds.[3] A 1-inch bearing with 0.10-thick walls, operating in a jet engine at a speed of 12,000 rpm will have a life expectancy six to eight times that of a solid ball. In aircraft engines this can mean doubling the operational hours before a teardown and overhaul is required, obviously a major gain in economical operation.

Hollow-ball bearings can and are being produced on Earth. A common method is to machine and then join two hollow hemispheres, this joining being the most ticklish part of the process. In zero-G a measured quantity of metal can be held in the open air—or vacuum—by a relatively weak magnetic field and melted by several means, including transmitted rf energy. When the metal reaches the molten state surface tension will pull it into a perfect sphere, a quality difficult

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to attain on Earth. A measured quantity of gas can then be injected into the center by a hypodermic designed for the purpose. The gas would expand a known amount at a known temperature, forcing the ball into a hollow sphere of the required size and wall thickness. Of course the gas chosen would have to be one that would not enter, or combine with, the steel in the walls but this is a minor problem. The hot ball would then be cooled rapidly, to prevent shrinkage, and returned to Earth for final polishing and sizing. In applications requiring very large yet virtually perfect bearings, such as the supports for radar dishes, these hollow bearings could justify the cost of space manufacture in the near future.

As the previous example illustrates, a major change of the weightless environment is that liquid materials become objects in their own right. On Earth liquids must be held in containers; buoyancy and thermal convection in one direction are always present, exerting their effect during the interaction with other liquids, solids or gases. Molecular forces such as adhesion and cohesion are present but of secondary significance. In zero-G this order of importance can be reversed, and surface tension made the prime factor that determines an object's shape.

Another relatively simple utilization of zero-G is adhesion casting of materials where the uniform density of each layer is a must, but difficult to achieve due to the product's shape. The mold can be suspended in space and the first casting applied, and if its consistency is correct the liquid will flow over the mold in an absolutely even layer. When the first coat has cooled the second can be applied (See Fig. 1). The process can be continued as long as necessary. Even if each succeeding coat melts the previous one there will be no particular tendency for the two materials to mix.

A zero-G application, where mixing is desirable, lies in the field of composite casting. The potential here is extremely high. Polymer-matrix composites such as "fiberglass" have become common construction materials. But there are fibers, or whiskers, available that exceed the strength of the polycrystalline, or amorphous ones now in common use, by at least an order of magnitude.[4] When a metal is the base, gravity-induced whisker segregation makes it extremely difficult to obtain a uniform distribution throughout the material. The phenomenon of absolute mixture stability characteristic to zero-G offers an unique opportunity to produce metal-whisker composites with the desired whisker distribution. It should also be feasible to fabricate components from this material in the same operation, leaving only the final machining to have a finished product. Depending on the base metal and the type of

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whisker, as little as 0.1% admixture can result in materials of greatly increased strength and ductility. Studies conducted on Earth indicate that the expected strength-to-weight ratio substantially surpasses that of any existing structural alloy.

And what of the whiskers themselves? In space it becomes possible to grow perfect, or dislocation free, metal crystals.[5] Dislocations, actually disturbances of the normal atomic or molecular configuration, are present in all crystalline substances, including metals. There are about a million such dislocations per square centimeter even in a high-quality metal crystal. The presence of these defects in metals limits their strength, which theoretically can reach millions of pounds per square inch, but also accounts for the ability of a given substance to bend without breaking. Dislocations are induced by the stresses imposed by holding fixtures, different heating rates, thermal convection, the trapping of inclusions, and condensations and vacancies. Zero-G levitation automatically eliminates most of these conditions, and the rest can be controlled by careful design of the forming apparatus. Pure metals grown from accumulations of perfect crystals would be so brittle a hammer blow could cause a bridge built of them to collapse, but as fibers they would have extremely high tensile strengths. In composite form in more common metals they could provide the materials engineer with a whole new range of products, with strength and bending characteristics not previously achieved. How they would be used depends on how ingeniously they can be applied in areas justifying their cost. Obviously no one will be building bridges of such expensive metals in the immediate future . . . but aluminum, reinforced with sapphire whiskers, or mixed whiskers of sapphire and aluminum nitride, becomes stronger than any present steel while retaining its light weight. Soaring arches erected on light supporting framework become practical. Someone will build them.

One area in which space manufacturing can justify its cost almost immediately is the growth of crystals for the electronics industry. A study performed on this subject[6] indicates that crystals of Potassium-Sodium Niobate (PSN) only 0.15 x 0.015 x 0.75-inch in size would have an immediate application in various ultrasonic and dispersive delay lines, some of which cost up to $5,000 each. Highly sophisticated delay lines are used in the Sentinel system and in European color television circuits. It is virtually impossible to grow a perfect crystal of PSN on the ground, and it becomes eminently practical in space. Also, a perfect PSN crystal would provide signifi-

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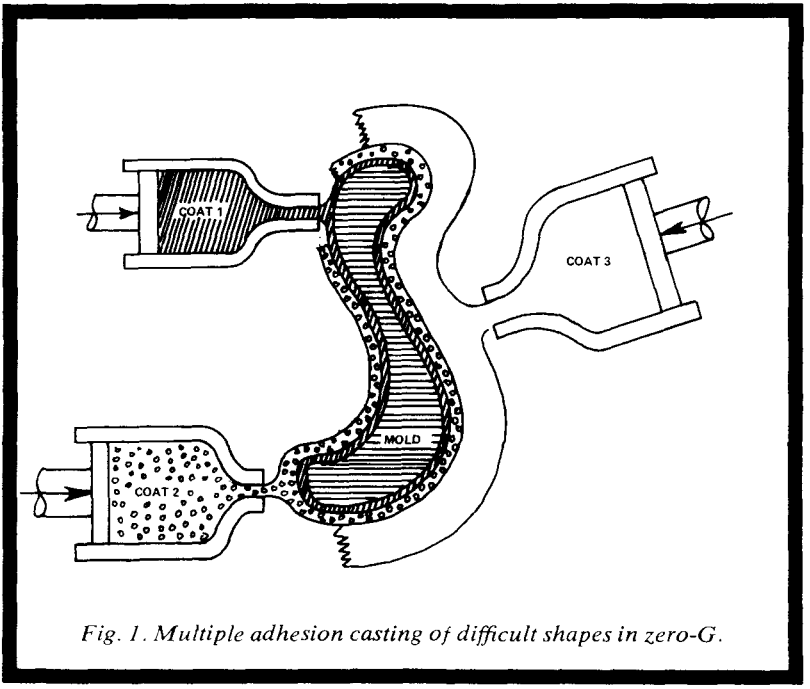

Fig. 1. Multiple adhesion casting of difficult shapes in zero-G.

cant improvemens in characteristics such as efficiency and response. Only slight improvements over the best now available would be technologically important, since better materials are needed to permit further advances in the state-of-the-art.

A far more glamorous crystal that can be grown economically in space is the diamond. On Earth diamonds, whether natural or man-made, have been produced by subjecting carbon to extremes of pressure and temperature simultaneously. The capital investment in machinery that can duplicate the work of nature is high, and the diamonds produced usually appear on the ends of metal-cutting tools, not engagement rings. But a radically new method already tried in the laboratory offers the promise of high-quality man-made gems. If a tiny diamond crystal is placed in an ultra-high vacuum chamber, it can serve as the seed for a much larger gem. When carbon is evaporated from a hot filament into a vacuum it has a very low vapor pressure equilibrium and will condense out on the crystal seed. The individual atoms arriving at the crystal face have enough excess

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energy to combine and form the diamond pattern rather than the lower energy graphite pattern—and will do so as long as no graphite model is available. The process is slow, and on Earth the cost of obtaining and holding the needed vacuum becomes prohibitive. In space high vacuum is available with the opening of a valve.

The high price of decorative diamonds is maintained by artificial economic controls, not true scarcity. When they are produced in quantity and made available to everyone their value will drop. But the crystal growth process that produced them can be adapted to other crystalline forms, with results impossible to predict. Substances that do not now exist, with properties that can only be determined by direct experimentation, will result. In the long run the process itself may prove far more valuable than any jewels it produces, no matter their size or beauty.

An area of space manufacture on which it would be difficult to place a value is that of microbiological applications in zero-G. The data from the two successful Biosatellites which flew before the program was canceled—the second one was widely publicized due to the death of the primate inside from the effects of weightlessness—proved that bacterial cultures grown in a liquid medium in zero-G produce significantly larger populations than identical cultures on the ground. In situations where large quantities of a vaccine are needed quickly, such as influenza epidemics, cost becomes less important than speed. A method has been proposed for fermentation dialysis of microorganisms in zero-G[7] Industrial fermentation techniques have been known for centuries, but the unique factor of zero-G makes significantly increased product yields and shortened production times practical in a large number of medically important pharmaceuticals.

Fig. 2 shows the basic structure of a fermentation device designed to operate in zero-G. This design overcomes one of the primary problems in growing microorganisms on Earth, the supplying of adequate oxygen to each tiny life form. The oxygen demand of microbial tissue is high, and oxygen is relatively insoluble in water. On Earth the only known way to achieve a high dissolved oxygen concentration is to bubble gas into a turbulent region at the periphery of a high-speed impeller submerged in the medium. The resulting upward rise causes a huge number of bubble collisions and a high degree of coalescence. The loss in bubble surface area means that the oxygen dissolution rate is inadequate for many rapid fermentation processes In zero-G swarms of minute bubbles can be formed from a sparger and expelled in a laminar flow, so that micron-sized bubbles will be

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dispersed uniformly throughout the culture medium. This would yield the required high rate of supply. Another advantage of zero-G is that the tendency of such organisms in cultures to form sedimentary deposits on the bottom of the container, with consequent decrease in the growth rate and often the health of the entire culture, would be eliminated.

In dollar terms, the United States Tariff Commission reported in 1957 that 1,000 pounds of Vitamin

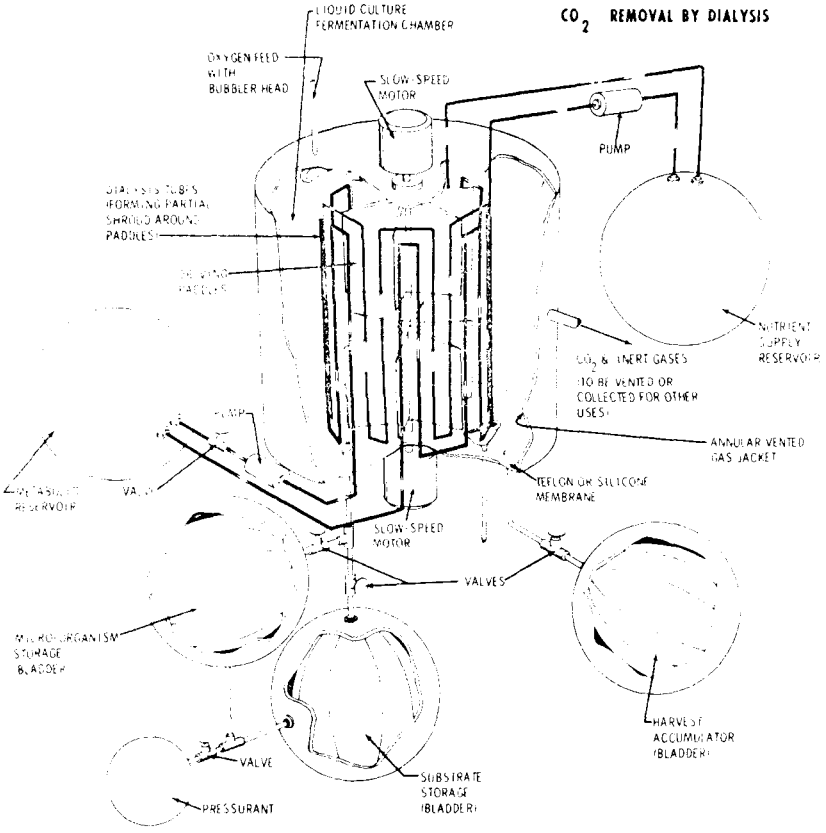

Fig. 2. Proposed zero-G fermenter for high-speed production of vaccines.

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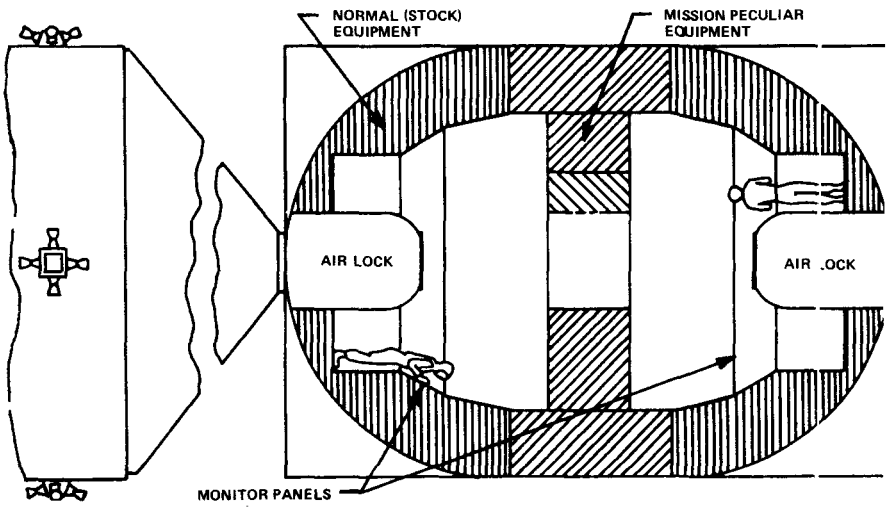

Fig. 3. Rough Design of basic 20 ft. by 30 ft. zero-G manufacturing module sized to fit existing launch vehicles.

B^{12} were sold for 44 million dollars. In 1958, 200,000 pounds of tetracycline antibiotics were sold at a value of 105 million dollars. Today the demand for antibiotics of the tetracycline class has more than tripled, but the cost of manufacture has remained essentially the same. Zero-G offers the first major cost reduction. As the state of the art of zero-G manufacturing progresses it seems obvious that antibiotics could soon be made more cheaply in space than on the ground.

One of the oldest projected plans for zero-G manufacturing is the casting of large optical lenses Huge reflectors such as the 200-inch glass at Mount Palomar approach the maximum size feasible on Earth, due to the stresses induced by gravity. Far-seeing scientists have long envisioned 400-inch, or perhaps even larger, lenses produced and retained in space for astronomical observations. This simple scaling up in size may indeed come to pass, but there are more immediate benefits available. In zero-G, by casting without molds, new glass compositions with previously unobtainable optical properties may be produced, since this

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production method will greatly reduce crystal nucleation sites. The glass would have a higher refractive index and a lower dispersion coefficient, greatly increasing the flexibility of lens design. The machining, or grinding, of such glasses is a complex process and the casting, at least for the next few years, would need to be returned to Earth for finishing. But these final steps are probably not as important as those stresses induced by the casting process in determining the quality of the final product.

There are many other applications where the impractical becomes the best method when manufacturing in space. Gases, in any ratio desired, can be mixed into liquid metals. In zero-G, with no tendency to rise to the "surface," the gas bubbles could be uniformly distributed throughout the structure. Metals light enough to float on water, but with most of the strength of the original, can be produced. The same principle can be applied to immiscible materials, those of weights so different they strongly tend to separate when mixed in the liquid state on Earth. This separation is a function of gravity, with the lighter material rising to the top. In space this would not apply, and new mixtures can be achieved. Ultra-thin membranes only a few molecules thick become practical, and could be combined into permeable membranes for such applications as large-scale sea water desalting. The production and separation of isotopes, specifically U-233 and plutonium from natural uranium and thorium, is another intriguing possibility. These two elements cost about $10,000 a kilogram at present, and have an expected world-wide market of about $100 billion a year by the end of the century as fuel elements in nuclear power reactors. It seems possible to use the sunlight available in space to power a large electrical generator and a high-current charged-particle accelerator to produce these isotopes by bombardment. The production of semiconductors for the mammoth electronics industry is a space "natural." Vapor deposition in the ultraclean vacuum of space will produce components where the admixture can be precisely controlled, possibly even attaining another of those advances in the state-of-the-art. Vacuum tubes, now rapidly being displaced by solid state devices in many applications, may flourish again when made to the specifications possible in zero-G and unlimited high vacuum.

Some of the items discussed can only be made in zero-G. Many more will be discovered when access to space becomes readily available and men are actually working within the new environment. Most of these processes will be developed within the confines of a factory operating in space, and NASA's

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Marshall Space Flight Center, a prime mover in the field of zero-G manufacturing, has been working on the design of the factory itself. In the beginning, since knowledge is still the most valuable known commodity, industrial research and development will dominate. The realities of space flight being what they are, laboratories will be designed in modular form, completely outfitted on Earth, and launched into orbit either by space shuttle or rocket. The module would attach to an existing government-owned space station, which would also supply part of the life support necessities for the research team. One such modular concept (Fig. 3) is 20 feet in diameter and 30 feet long,[8] with a gross liftoff weight of 30,000 pounds, including air, water, and other expendables. It can be operated by a crew of three, alone or in conjunction with other modules and crews. After all planned experiments have been conducted and the data recorded, the information could be returned to Earth for final analysis and correlation. The module would be discarded in orbit, or burned up by reentry.

From completed industrial research to production is a relatively short step. But in the case of space manufacturing it requires some radical rethinking of accepted norms. The size of a factory is usually figured in floor space. A production line is a linear series of machines, or work stations, where an operation is performed on the product as it passes through. In space there will be no need for such a linear sequence. When a particular machine is not needed it can be placed outside the main factory building, where it will remain in orbit and retain its position in relation to the main building indefinitely. The central enclosed facility could be comparatively small, since only one or two individual machines would be brought inside at a time. The device that would make such applications practical is a mechanical arm, at Marshall called the "serpentuator." The one now planned has a length of 500 feet and the ability to extend in all directions. The cubic footage available for convenient machine storage and recovery in a sphere a thousand feet in diameter is equal to the floor space in ten large aircraft hangars on Earth. A space factory might appear to an outside viewer as a swarm of equipment surrounding the central core, with machines being returned to the group or drawn inside as needed. In a sense each machine represents so much floor space, and the product remains still while the machine is brought to it for the performance of its function. This is an excellent example of the radical thinking required to operate efficiently in space.

As with most new enterprises, space manufacturing will begin on a small scale and grow. A study

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published by the American Astronautical Society[9] foresees a commercial space station of immense size in the 1990s (Fig. 4). In this concept six separately launched modules 80 feet in diameter by 70 feet long are joined to form the central core. Crew quarters and the independent industrial facilities are launched and attached in the manner shown. The two six-story crew quarter modules rotate and provide a low artificial gravity. The manufacturing modules are shown as ten stories, but could easily be any length desired that the launch vehicle could orbit. In size and capability this would be a true factory, manned by 200 persons and producing a variety of goods made better, cheaper—or only!—in orbit. The study indicates that the costs of building and operating such a facility would exceed a billion dollars a year, including the logistics requirements. But it could produce goods that would not only recover this sum but return a profit.

Manufacturing in space will de-

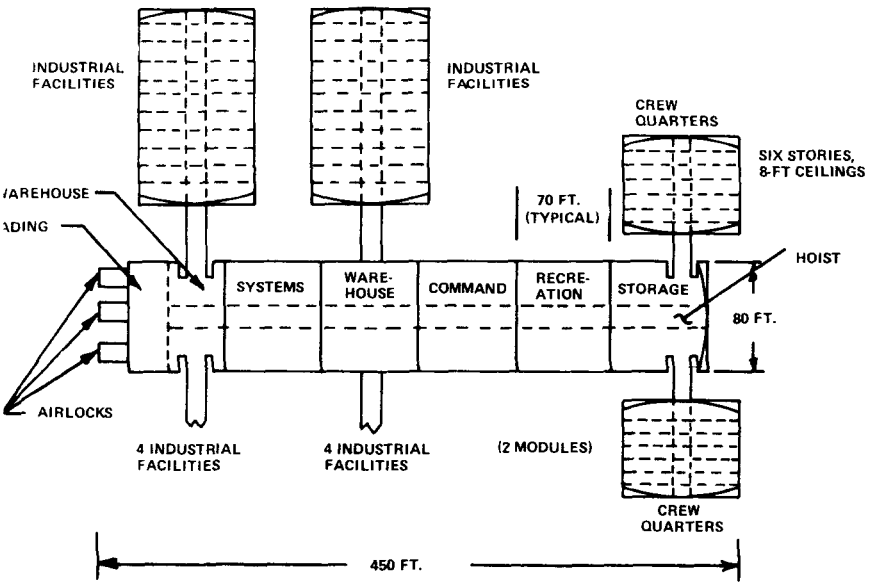

Fig. 4. Huge zero-G factory proposed for the 1990's; Crew of 200 would produce over billion dollars of goods per year.

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velop and grow within the larger context of the entire United States space program. That program will be financed and controlled by the federal government for the foreseeable future. Since manufacturing in the U.S. is primarily a private enterprise function, the present tendency toward close cooperation between government and industry will be accelerated. Even after the reusable shuttle becomes operational the cost of a pound of material in orbit will remain prohibitive for many years. When you add the weight of the humans and their life-support equipment to the total it becomes obvious that a product made in space must be worth thousands of dollars a pound to fully pay its way. But if government absorbs most of the transportation cost, in the same manner it provides the bulk of highway building expenses, air traffic control, ocean shipping subsidies, et cetera, private companies would be required only to design and build their manufacturing equipment. It then becomes eminently practical for a private corporation to engage in orbital manufaturing in the near future. The most likely compromise will be that the U.S. Government will charge a fee for orbiting manufacturing modules, in the same manner it charges the Communications Satellite Corporation and other users the estimated expense of launching private satellites.

The first practical steps toward manufacturing in space have already been taken. When the United States' first orbiting space station, the Apollo Applications Workshop, flies in 1972 it will have five space manufacturing experiments aboard.[10] These will be contained in a chamber that can be vented to the exterior to produce a vacuum of 2×10^{-4} torr, and the entire Workshop will operate under zero-G conditions. The experiments have been designed to permit the astronauts to operate the various items of equipment from a small control board where they can observe the results. The five items are concerned with electron beam melting and welding of metals, exothermic brazing, single-crystal growth with gallium arsenide, exothermic composite material casting, and the forming of spherical shapes. If each of these processes performs as expected in theory, the practical utilizations outlined earlier in this article will certainly follow.

NASA already has on the drawing boards a larger 12-man space station planned for the mid-Seventies. A list of over a hundred manufacturing experiments has been proposed for this vehicle, many of which will find their way aboard. Some time in the 1980s space stations with a capacity of 50 or more personnel, probably with semi-independent manufacturing modules attached, will become a

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reality. The huge station envisioned in the AAS article may, or may not, fly in the proposed 1990s period . . . but so far almost every major scheduled expansion into space has been ahead of, not behind, the original target dates established by advance thinkers at the dawn of the space age.

Space is a new frontier, and while glamorous scientific discoveries on the origin of the moon and the behavior of the sun are likely to dominate the headlines, the engineers and technicans of the world will proceed in their purposeful, methodical way to utilize the unique environment and produce new and better products for us all. It has been that way since that early experimenter added a bit of tin to his copper ore before melting it down, and an early engineer saw an immediate application and hammered out bowls and swords. Thus it will be into the indefinite future. Man changes far more slowly than his technology. ■

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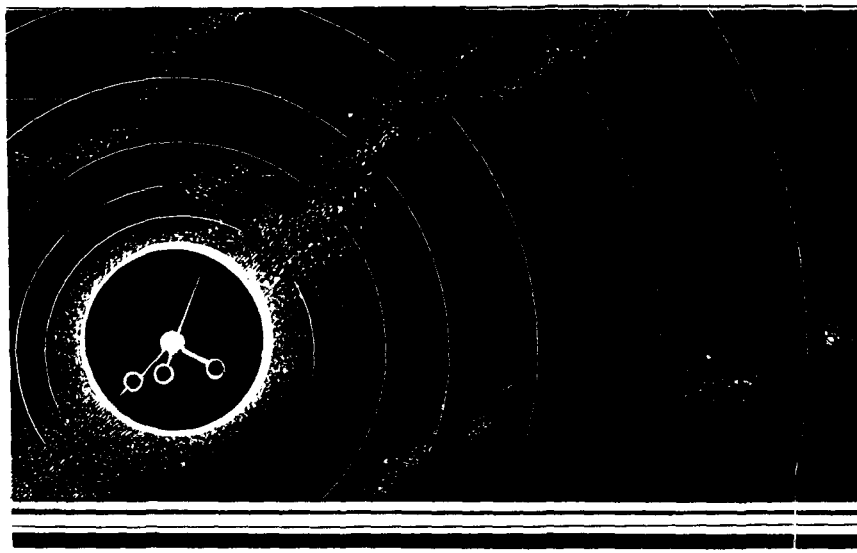

big time operator

It was a great way for a "hot" crook to escape from their era— and guaranteed to work.

JACK WODHAMS
Illustrated by Vincent di Fate

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Elswick Gansy was in his cups. He chuckled happily. "It's the sweetest." His arm waved in sweeping signal. "Waiter! Waiter! More champagne at this table!"

Seffan smiled. He'd made it his business to get close to Gansy over the past couple of days. Now they were quite good friends. Gansy should soon be right for the payoff. "El, you brag a lot. To hear you talk, you've got your own private gold mine."

"Huh? Huh? Hey, that's good!" Gansy laughed. "You might be right, at that." He smirked at his company. He placed a finger against his nose and winked. "A gold mine." He giggled. Then he threw himself back to roar with merriment. He was in a very good humor indeed.

A fresh supply of champagne arrived. Gansy insisted on doing the pouring, with great exuberance and gaiety, and the girls squealed and the men clinked glasses.

Seffan paid the bill over Gansy's protests. "I'm having a great time," Seffan declared. "To see you happy makes *me* happy. It's not every day we meet a man who knows how to live and enjoy himself."

Gansy was in too cheerful a mood to fight over anything. "Ain't that right, though, ain't that right. If you got it good, enjoy it, hey?" He guzzled some champagne. "Live!" His glass slopped liquid as he gestured. "What's money? Hey?" Archly, he winked again. "What's money? World's full of it, right? Hey," he leaned forward, crooked a finger at Seffan, "here." He put down his glass, dug into a pocket. He produced a few coins, threw them onto the table. "Take a look at those." And he hiccuped.

Seffan deftly reached to beat the scrabblers, took a look. He frowned. "What are they?"

"Huh? What are . . . ? They're guineas, of course, stupid. Golden guineas." Gansy beamed, blinked. "You can have 'em," he said with blithe largess. "Plenty more where they came from." He turned his attention to the female breathing down his neck. "Come on, honeybunch, drink up, or the night's going to beat us to it." He reached for another bottle.

Seffan's lips were curved upwards, but his eyes were shrewd. And his fingers tucked away the gifted guinea.

"What do we know about him?"

"He's from the East. You know Wockskanci, the pusher? He knows him." Seffan very soberly fooled with his guinea. "Petty fraud. Inside he met up with the Brakker gang, and from all accounts was the wheel for them on some of their later jobs." Seffan flipped the coin. "Small stuff. But now he seems to be loning. And doing all right."

"Yes." Mr. Ciano looked very thoughtful. "Most curious. Gold coins, hm-m-m?"

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"He's got a bagful in his room, must be a couple hundred. He boasts he can get plenty more."

"Treasure? He's found a hidden hoard?"

"I don't know. When I try to pump him, he starts playing coy." Seffan snatched the coin from the air. "He's onto something. I *know* it. No crime, he says. No proof, he says. Like taking candy from a baby. And he nearly laughs himself sick."

Mr. Ciano smoothed an eyebrow with a finger. "Interesting." He held out his hand for the guinea. Seffan handed it over. Mr. Ciano rolled the coin at his fingertips. "Very interesting. I think we should have a more formal talk with Mr. Gansy, no? To discuss his apparent affluence and, ah . . . perhaps talk over some investment opportunities—"

Elswick Gansy did not much care for the two hard-faced characters who stood at his shoulders. And he did not care for the change in his friend Seffan. And he did not much care to be here confronting Mr. Ciano. Taken all around, he really did not much care for the situation at all.

"We are just curious, Mr. Gansy, that's all." Mr. Ciano was affability itself.

Gansy could not prevent popping sweat. This was too much. His unguarded flamboyance had brought him to the notice of the heavies. "It's nothing," he said. "Just a little sideline of my own. Just to . . . keep me in pocket money, that's all."

"Yes?" Mr. Ciano clipped a cigar, wetted the end for his lips. Seffan produced a light. "We are always looking for new sidelines, bright ideas." Smoke billowed. "Maybe we can help you. We have contacts, outlets. If you have a good thing, we can help you develop it, get the most out of it. You understand?"

Gansy rubbed his damp palms together. "It's nothing. I just . . . struck lucky, that's all. I'm . . . I'm not as rich as I pretend. It's a gag. I've just been putting it on . . . to live high for a while for once in my life."

"Yes?" Mr. Ciano clamped his cigar and tipped the contents of a small sack out onto his desk. "Where did you get these?"

Gansy loosened his collar. "They . . . A legacy. An aunt of mine died and she left them to me."

"Uh-huh." Mr. Ciano poked at the glittering spillage. "These are all British coins, dated in the 1600s. Good condition." His eyes pierced cigar smoke to bore into those of his twitchy guest. "Where did you get them, Mr. Gansy?"

"I . . . I told you, I . . ." Gansy looked up, left, right, at Seffan, back to Mr. Ciano. He found no comfort anywhere. He was out of his league. He'd made a mistake with Seffan. Perhaps . . . Gansy

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swallowed. He was stuck. Either way he was stuck.

"We want the truth, Mr. Gansy." Mr. Ciano smiled. "You may trust us. What you tell us will be kept in the strictest confidence."

"I . . ." Sweat ran into the corner of Gansy's mouth. Just then he would have liked to have chickened out. "I can't. It's . . . It's a secret." It sounded foolishly lame.

"Mr. Gansy, I am a busy man, so please don't waste my time. You have discovered a source of bullion, and this is very interesting to me. I am a buyer and can give you a good price, but I want to know who I'm dealing with, and know how reliable you are. In other words"—he leaned forward to snap—"I want to know just how hot this gold is!"

"It's not hot at all!" Gansy blurted. "It's—" He stopped. How had he ever got into this? Too late now. He pulled out a handkerchief to dab his face. "It's all legitimate. Honestly."

"Not taken from a sunken ship? Not stolen from a museum, deposit box, some dear old lady you sweet-talked?"

"No. It's straight, I tell you, untraceable."

"Then where did you get it? Did you find it? Dig it up somewhere?"

"No, look," Gansy appealed, "you've got me wrong. Just a few coins, that . . . doesn't mean anything. I . . . collected them, picked them up on my way around."

"Seffan here says that you claimed to know where there was plenty more. And a collector does not throw away handfuls—even when he's drunk. Now one way or another, Mr. Gansy, you are going to cooperate with us." There was menace in Mr. Ciano's tone that made Gansy shiver. "I think it would be better for you to work with us rather than against us. Those who try our patience can get to live short lives of deep regret."

Thus Gansy felt that he had no alternative. He licked his lips. He'd got himself onto this spot through nobody's fault but his own, so now he'd *have* to tell them. He knew nothing else that would sound so plausible. It was crazy, but . . .

"Look, I'll tell you," Gansy said, "but you won't believe it. There's this fellow, see? And—"

The car stopped but the dust cloud didn't, and enveloped them to make visibility bad for a minute or two.

The occupants peered out. "This is the place?" Mr. Ciano did not sound impressed.

Despite the air-conditioning within, Gansy was sticky with sweat. He'd been sweating solid for the last three days, ever since Mr. Ciano had desired to make his acquaintance. He hauled on the handbrake. "This is it." Gansy tried to turn on good cheer. "Well, he should be waiting for us. Like I said, it's up to him."

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"I think we might persuade him." Mr. Ciano jerked his head.

The car burst its sides, and the passengers got out. Five men: Seffan, Mr. Ciano, his two henchmen, and Gansy.

They viewed the bleak, shallow canyon, the sparse scrub and dusty rock. They tasted the dry late-afternoon air. They gazed at the squat and ugly cement building that seemed part-buried into the side of a low cliff—very unobtrusive. Hard to spot from the air; remote and unlikely to be found on the surface.

The quiet was broken by the slamming of the car doors.

"Let us go," Mr. Ciano said.

"Sure thing," Gansy said, as lightly as he could manage. He led the way. "There's a door around the side."

Their feet stirred red dust again as they made their way forward. Mr. Ciano had kept his jacket and hat on, his tie tight. The others were down to shirt sleeves and shoulder holsters. There were no windows or apertures in the concrete structure, and the door at the side, when they came to it, was made of steel.

Gansy gave his comrades a nervous smile, met no reciprocation, reached for a raised square plate, and pressed.

They waited.

And waited.

"There's nobody here," Seffan said. It was the most desolate hole he'd seen in his life.

Mr. Ciano said nothing, but his look made Gansy squirm. Way out into the middle of nowhere, to somebody's abandoned atom shelter. Lonely and ludicrous, a chase to a faceless bunker. Mr. Ciano was not prepared to be amused.

Somewhat desperately Gansy pressed the plate again.

Nothing happened.

"Maybe the bell is not working," Moke, a henchman, suggested, his teeth baring unpleasantly. "Or maybe the lady of the house has gone shopping."

"He's here," Gansy protested. "I called him on his special line. I *know* he's here."

The other henchman, Carl, drew his gun from his holster. Gansy's eyes bugged. But the man only turned it around with the intent to use the butt on the door.

But before his first blow could fall there came a sharp *clack!*—as a slot in the door was snapped open. "Hey? Who's that? Who's that?" came an irascible voice. "Coming at all hours. What do you want?" The framed beady eyes lit on Gansy. "Oh, it's you, is it. I might have known." And very tartly, "Brought enough friends with you, haven't you? What do you think I'm running here, a seminar?"

Gansy was self-effacing. "Doctor, these . . . these men are very interested in your project." And he added quickly, "They're willing to pay."

"Hm-m-m. I should think so.

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D'you think I don't know what they're after? D'you think I'm a fool? Blasted nuisance." The eyes studied them with marked disfavor.

Gansy perspired profusely. "Please, Doctor." There was a wheedling note in his tone. "You wouldn't want this place to become generally known to the authorities, would you?"

The doctor glowered at him. "Bah!" The aperture was slammed viciously shut.

For a moment it looked as though the interview was ended. And then the steel door was dragged open.

The doctor stood aside, scowling, very disgruntled. "If you must, you must—come on then. But be sure you don't touch anything."

The visitors trooped in, the eyes of Mr. Ciano very narrow.

Dr. Leigher had the clipped voice of a teacher who hated to say a thing once, let alone twice. His three-day beard and extremely grubby dustcoat did not detract from his querulousness. "It is not a time-machine but a time-and-space transposer. There is a precise coordination of movement through both time and space, and I am able to move a body from point 'A' to point 'B' as I choose, providing all prior conditions have been fulfilled."

It still sounded like hokum to Mr. Ciano, and yet . . . He looked at the heavy cables snaking across the floor. "What's behind those double-doors—your power plant?"

"Yes." Leigher was wintry. "Would you like to have a look? I'll unlock it for you. You might find the effulgence therapeutic."

"Effulgence?"

"Yes—radiation!" Leigher exploded irritably. "What do you think—I'm hooked to the town supply? What do you think I'm doing here—something that can be run on thirty-two volts and a bicycle?" He snorted. "I need a constant infallible supply without risk of breakdown." He pointed a none-too-clean finger. "It's down there, half-a-mile away, shielded by the earth itself."

"You dig your own tunnel?" Seffan inquired.

Leigher was acid. "Very funny. As it happens, this is an old gold-mining site, and some of the shafts have proved very suitable to my needs."

Mr. Ciano, stepping carefully, circled the transposer chamber. Again he noted the thickness of the leads trailing to the barred double-doors. "It doesn't seem much," he said. "But it's like an iceberg, eh? Most of it out of sight."

Leigher sniffed. "Hardly an iceberg, but yes, quantitively, that might convey the impression."

"And the power is constant, ready to be tapped at any time?"

"The field is kept open at all times—has to be. To switch off, or close down, would be to break con-

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tact. I can't allow that to happen, and there is no provision here for a cut-off switch. So, if you'd like to 'lose' somebody into the past by shutting off the power, you'd have to destroy this entire installation. And believe me, it would not be worth it."

"I was not thinking of anything like that," Mr. Ciano said. "If it really works, the last thing I would wish is to interfere with the power."

"No." Leigher removed his glasses and began to clean them with a filthy handkerchief. "I know what you want," he said bitterly. "The same as the others. Easy pickings."

Mr. Ciano pretended mild shock. "Easy pickings? My interest is primarily historical." He indicated some furniture and bric-a-brac that was piled in one corner. "Although I admit that I have a passing interest in, ah, antiques."

"Oh ha-ha," Leigher said sarcastically. His fingers flicked at the henchmen. "That's why you need your armed guards, I suppose?" he sneered. "And what's in the suitcase? A small arsenal, I shouldn't wonder."

"The suitcase contains items we thought might be useful should certain contingencies arise." Mr. Ciano tried to be crushingly icy. "What weapons you may see are purely for self-defense in case of an emergency."

"Oh ha-ha," Leigher said again. "Do you think I'm an idiot? I know who you are. You're the same as him"—his finger jabbed at Gansy—"a help-yourself crook. Well I don't care. If you shoot somebody dead, they've already been dead for a few hundred years, so it won't make a great difference anyway. If you want to help yourselves, you can. But I'm certainly not going to aid you for nothing."

"You've had . . . other friends through here?" Seffan asked.

"I most certainly have," Leigher grated. "Thanks to my own kindness to a dying wastrel I rescued. As it turned out, he was on the run from the police. Since that time I seem to be getting an ever-increasing number of his fellows calling at my door. Most of them making promises that they subsequently fail to keep." He glowered at Gansy.

Gansy was hurt. "I paid, didn't I? One for one. Guineas are worth more than dollars."

Leigher's smile was mirthless. He rammed his glasses back on. "Perhaps. But trying to spend them creates a great deal of unwanted attention, and I am not as familiar as you may be with discreet methods of disposal." He breathed very hard. "If you want to clean out a Seventeenth Century bank, all well and good. But I want to be paid in dollars." And with a touch of fierceness to Mr. Ciano, "And I want to be paid in advance."

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Mr. Ciano squinted, sneered in his turn. "How do we know you can do what you say you can do? What if it's a frost?"

"Then that'll be through your own incompetence," Leigher said sharply. "Look, I've had enough of you people coming in here, making grand promises to share what you make, but putting up not a nickel beforehand. And what do I get?" He steamed. "If they *do* come back, they bring me junk." He gestured at the assortment of ancient pieces. "I'm in the furniture business?" His voice was high with indignation. "No! If you've come here to make use of this device, you're unlucky. No more! No more!" His hands swept angry negative. "I've had enough! I'm through!" He seemed very cranky.

Mr. Ciano was quick. "You said, 'if they *do* come back'—does this mean that some of them *don't* come back?"

Leigher glared at him. "It means exactly that. Do you know what it's like in the past? Can't you appreciate the advantages? A modern man there is a king. Armed even with only a .38 he is virtually invincible." Leigher's head nodded. "Oh, yes, I've had some promises. Fat lot of good it's done me. They just throw away their recallers and don't give a damn." He shouted, "I've had enough of it, I tell you!"

Even Mr. Ciano flinched at Leigher's vehemence.

"Take it easy, Doctor, take it easy," Mr. Ciano placated. He clasped his hands in front of him. "You deal with me, and everything will be square. I'm no two-bit punk. I'm here on business. If what I've heard is true, we should be able to come to some arrangement to our mutual advantage. And I can see to it that you are protected and don't get bothered by strangers any more."

Leigher was skeptical. "I've heard such stories before. You people are all the same. Promises," he jeered savagely, "always promises. Well I'm not taking promises any more. You can do what you like. You either pay beforehand, or you get nothing. I'm sick and tired of freeloaders."

"Relax, Doctor, relax," Mr. Ciano soothed. "I represent sound vested interests, and we'll be glad to put up whatever capital you may need."

Leigher was unconvinced. "I'll believe it when I see it. I'm not being taken in again. The purity of your motives and intentions are no concern of mine. You can save your talk. Now it's cash or nothing."

Mr. Ciano pondered briefly. Then he gave Seffan a slight nod.

Seffan opened his valise. He produced one wad of notes. And a second wad of notes. And another, and another. He placed all four bundles upon a small table that could have been designed by Chippendale.

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"Your price per man is twenty thousand dollars, I believe," Mr. Ciano said. His eyes were intensely searching. "There is enough on that table to pay for the passage of two. If it is a success, there is more where that came from—you will be paid, no haggling." He waited to let that sink in.

"Hm-m-m." Dr. Leigher strode to the table, picked up the money, riffled it, seemed satisfied. He started to stuff it into his pockets.

Seffan startled him with a cautionary grip on his elbow. "Not so fast, Doc."

"What? Look, what is this? I thought it was a payment?" Leigher was disgusted. "Either it's mine, or it isn't. I'm not going to play games."

Mr. Ciano waved Seffan off. "Go ahead, Doctor, it's yours. But before you send anybody away," he was coolly pragmatic, "we would like to see a demonstration . . ."

Leigher was a trifle ruffled. "A demonstration? What do you have in mind?" He thrust the last bundle of money into a dustcoat pocket, adjusted his glasses, returned his hands to swell the bulges. "If you experience it, it demonstrates itself, surely? What more do you want?"

"First I want you to send one of us." Mr. Ciano raised a considering eyebrow at a henchman. "Carl here, say—and then bring him back. If his report corroborates your claim that you can send people into the past—and recover them—then others of us will go to explore the prospects. Isn't that reasonable?"

Leigher shrugged. "I'm giving no free rides. You want a demonstration, you'll have to pay for it. That will count as one."

"That's pretty tough," Mr. Ciano argued. "We'd only want him to be in the place long enough to confirm that your device *does* work. A half hour, an hour, just to look around and give the O.K."

Leigher was patronizingly cynical. "You can do what you like. You pay for two journeys, and two journeys you can have. I won't take any responsibility for the way that a person may react at the other end."

"What do you mean by that?"

"I've told you. A modern man thinks differently when he gets back there. Even a dumb modern man knows so much more. There is opportunity on every hand, power—you don't realize how tempting it is."

"You mean Carl might want to stay there?" Mr. Ciano's jaw set. "He knows better. He'll do as he's told, or he knows what he can expect."

Leigher was mocking. "Yes? What jurisdiction will you have over him a few hundred years back from now? Would you like to waste time, effort and money sending people to hunt for him in those times? Where are your contacts?

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Where would you search? And could you find men you could trust not to do the very same thing as the man they were looking for?"

Leigher was sardonic. "I know, I've had some. The past is virtually virgin territory to a modern man. And it's a big world, where it is easy to gain favors from influential people for services rendered. A modern man, *any* modern man, can become somebody. I've had," he thought and mentally counted, "nineteen people come to me to take a so-called 'temporary' trip into the past." He paused, then added with heavy emphasis, "Only three ever came back. And he"—he pointed at Gansy—"was one of them."

"How do you know that they stayed there deliberately?"

"Because they tie their recallers to pieces of junk like that!" Leigher cried, exasperated. "Furniture, knick-knacks. They think it's a joke!" He took a few paces to relieve his irritability. "They seem to think I can operate on thin air. Well, no more. From now on I'm taking no chances."

Mr. Ciano brooded. "Is there no way you can recall them, whether they want to come, or not?"

"Arbitrarily? No. The recaller must be worn properly. It is not all that comfortable, and looks odd, so it is generally taken off. Thus I dare not recall anyone unless I get the correct signal." He shook his head in despair. "And when I do get the signal, it so often has turned out to be something like that unfinished statue from medieval Florence." Leigher stared at Mr. Ciano. "You must know what you're doing. It's not quite as simple as it looks."

Mr. Ciano dug out a cigar to help him think. He nipped the end, tasted, frowned, took a light from Seffan. His unblinking contemplation of him made Carl uneasy.

Mr. Ciano broke to study his smoke with seeming concentration. "So," he said, "is there no way that we can be sure that a traveler will return . . . will *want* to return?"

"There is." There was a devilish light in Leigher's eye. "I have given the matter some thought, and I *do* have one solution." He walked over to his Queen Anne escritoire, opened a drawer, brought forth a tube. "This." He tapped the plastic. "One of these pills will kill in six hours. Allowing an hour beforehand for it to be fully assimilated into the system, and one hour afterwards for a safety margin, that will leave four hours in-between when the volunteer can make examination of the past. But, if he lingers overtime he will die, for the antidote is here."

Mr. Ciano halted in mid-puff. "Well." He liked it. "That sounds like a good idea."

Carl shot a glance between the pair. It did not sound such a good

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idea to *him*. "I'm taking no poison," he warned.

"Carl!" Mr. Ciano was sternly abrupt. "You will come to no harm. You will get back here after two or three hours, take the antidote, and that's all there'll be to it."

"Yeah? I'm taking no poison," he repeated. "Supposing something should happen? Suppose I got knocked on the head? Suppose I lost this recall thing? No. I'm sorry, Mr. Ciano, but that's *out*." Mr. Ciano was grieved. He went a little red, but he could see that Carl was adamant. He filed this intractability for future reference. "Very well, Carl. Then it will have to be Moke. Moke?"

Moke was checking the magazine on his pistol. He did not raise his eyes. "I don't think I'd like it either, Mr. Ciano. It'd be sorta against my religion. Fooling around with poison, I mean, a man could get killed. It'd be easy to make a mistake, wouldn't it?"

Mr. Ciano became tense. He was unused to such flagrant insubordination. Way out here, they suddenly thought they could do as they pleased. He came within an ace of losing his temper. "Seffan?" It came out very tight-wound.

Seffan relished the thought of imbiding some toxic substance no more than did the others, but he was more slyly diplomatic. "Surely it would be best to send someone experienced, someone who knows all about it and who would, therefore, be less likely to make an error?"

The others followed the direction of his gaze.

"Huh?" And Gansy jerked to quick attention.

"Now wait a minute! I've been there before," Gansy said. "Why send me? I've already told you what it's like."

"Perhaps we would like you to tell us again," Mr. Ciano silkily replied. "To personally show us how it works."

"Huh? Look . . ." Gansy took in the circle of faces. "Be reasonable, I've been already. *I* know it's all right. What's the point of me going again? What'll it prove?"

"We wish to witness the sequence, the procedure. I think you might satisfactorily play this role."

Gansy's hands fussed at his belt. "I don't see it. It would be better for Seffan to . . . to check. You can take my word for it—you've got that already. It . . . needs somebody else."

"We're not calling you a liar, Mr. Gansy," Mr. Ciano reproved him. "We believe you. Why be so troubled about going again? It will only be for a few hours."

Gansy wiped at his face. "It doesn't make sense." He smiled weakly. "*I've* been. It'd be better for someone else to go." He appealed to Dr. Leigher. "Wouldn't it be more logical for . . . for Carl, or Seffan to go? I mean . . ."

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"I couldn't care less, quite frankly," Leigher informed him crisply. "You can sort it out amongst yourselves. And when you have decided you can let me know."

Gansy did a re-take of his "friends." "Well," he wasn't really happy, but he gave in, "I think it's crazy. But if that's the way you want it, it's O.K. by me. But," he made a firm stand, "I'm taking no poison."

"But you must," Mr. Ciano said pleasantly. "It guarantees your safe return."

"I don't need it!" Gansy began to pop sweat all over again at the thought of what he was doing. "I . . . I came back last time, didn't I? It doesn't affect me. I don't *want* to stay in the past."

"In that case to come back for the antidote will put little strain on your wishes, even should you meet a fair damsel," Mr. Ciano observed. "It is an innocent precaution against temptation—for your own security. I don't see that you can have any objection."

"I refuse to take poison!" Gansy said loudly.

There came disagreeable *cluck-snack* noises from a couple of handguns in the room, and Mr. Ciano's henchmen eased out to give Gansy meaningful attention.

Gansy slowly rubbed his hands over his hip pockets. "No," he protested feebly. "No."

But he was outvoted.

The recall outfit was a light metallic band that fitted over the forehead, with leads trailing to a button-signaler strapped tightly to the chest. A few more leads led to thin metallic anklets. The unfortunate Gansy was ready to be positioned in the space/time-transposer chamber.

"The polarity is important," Leigher was saying. "The frequency differential between the composition of these metals is known, and is unique. They don't look much, perhaps, but they form the identity location marker in time and space." He took Gansy's elbow. "Come."

They stepped into the tubular chamber. Gansy shone with perspiration.

"Now. In the center, near enough. Feet together, stand upright. The distance between the contact bands is important," Leigher explained to his audience. "Around the ankles below, or even worn stirrup-fashion. And on the head worn," he smiled bleakly, "like a laurel wreath. The distance between the two is vital. On no account, when being sent or recalled, should one set, or the other, be held in the hands. And neither should the body be bent in a position to bring the head and feet closer together. This would foreshorten the field, with possibly disastrous results. No one seems to have tried it so far, and it is not recommended that anyone do so.

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"These bands are tougher than they look, and collapse to quite a small package that can be carried in a pocket with no inconvenience. This," Leigher pointed to the small matchbox-size button-box, "is the recall signaler. On arriving at the destination, open the front and press the button once. This will indicate intact arrival, and that circumstances are satisfactory. Pressing the button twice will indicate that the time and/or place of arrival is inopportune, at which the traveler may be immediately carried forward to another date and alternative venue.

"After arriving satisfactorily, the double signal may be employed in order to jump from one week to the next. But if more than three such jumps are attempted, there will be an extra fee to pay, and the fourth double signal will be interpreted as a triple signal—the recall advice."

Critically Leigher looked Gansy over, and found everything wanting but his equipment. "To press the button three times in succession is the triple signal that requests recall. Be sure that the bands are in place and that the bodily stance is that of one standing at attention—thus to keep well within the bounds of safety. That way there is nothing to fear."

Leigher produced a small oxygen mask, gave it to Gansy who, without enthusiasm, tied it over his nose and mouth.

"There is some risk of breathlessness on the journey, although it doesn't take long in subjective time. To counter this there is this mask and miniature oxy-tube, which is more than adequate to serve its purpose. It is not absolutely essential, and if it gets lost, recall without it should not be a serious threat. Everything is here to resuscitate the needy in the unlikely event that a mishap should occur."

"Right, Mr. Gansy, you are ready? Good. Come, gentlemen, stand clear of the chamber, please."

Leigher moved out and over to his console. With its cover removed, it was a gleamingly impressive long, low computerlike instrumentation. Leigher threw switches, and a light bleeped red-red-red. He scanned his illuminated inlay chart of the counties in South-east England, brought in a blowup of North Middlesex. *Flick, flick,tuck,tock,tock,tock.* Unhesitating, efficient, sure of himself. In went the main power gate.

Ssss-sook. The curved door to the transposer-chamber slid closed, shutting off Gansy's damp and rigidly upright figure, and from somewhere came a hum that rose to become hard for human ears to bear.

Leigher was absorbed in his function, checking this dial and that, making an adjustment here, moderating there, flicking switches, closing a second power gate. He

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raised his eyes and screwed around to regard the festoon of insulators and boosters worn like a crown by the high dome of the chamber. He saw the flash, the confirming trigger, and he closed the major circuit.

There was a *bang!* that made everybody but Leigher jump, and the humming dropped sharply to become a steady purr.

Mr. Ciano gawked at the time-indicator that he had found, saw the day-wheel become a blur, the month-indicator flipping by, the year slot jitter to: 1948—1947—1946 — 45 — 44 — 43 — 42 — 41 —, faster and faster, in seconds to become a blank shimmering with speed.

Leigher had half his attention on the Southern Counties map, bringing a small bright dot to the north of Middlesex, cutting to the blowup again, tuning a dial with one hand, sliding a knob through a gradated slot with the other, keeping an eye on the pre-selector, quick of movement, certain.

The date-recorder slowed, slowed, rapidly — 1683 — 1682 — December — November — October — September — August — 22 — 21 — 20 — 19 — 18 — 17 16 — . . .

Leigher's hands flew, *click, tuck, tuck, poomp, poomp.* August 3rd crept over to become August 2nd. Moments hung poised. Leigher slammed over a lever. His eyes went to a thick and oddly-coiled aerial at the back of the console. Its tip burst into a bright orange glow. Once. Twice.

"Damn!" Leigher re-opened the channel, re-tuned the locator, made fresh adjustments.

Mr. Ciano saw the date revolve—August 3rd, 4th, 5th, through to 10th. Again Leigher slammed the lever to positive.

He watched for the orange light. It came. Once.

"Ah." Leigher relaxed. "Good." He went over his bank of buttons, cutting-out, locking-on, setting the recall on auto.

Sssss-sook, the curved door of the transposer-chamber slid open

Seffan went over to take a look. There was a peculiar smell. There was no sign of Gansy. Seffan felt his skin prickle. It was queer. He shook off the feeling and went over to listen-in on some of the technical data that Mr. Ciano was gleaning from Leigher.

Gansy got mud on his shoes. His feet were soaking wet and even his pants cuffs were soggy. Mud. He'd get it on the rest of his clothes. He swore silently to himself. He didn't like this poison-antidote business. If something went wrong . . . He didn't entirely trust Leigher.

Four whole hours poking around—what was he supposed to do? This coat he'd got was not a very good fit. Still it was better than nothing—this place was like a freezer. He looked about him.

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What a great century to be in. Anything was possible here. These people would believe anything. There was a fortune to be made.

Four hours. Not much longer. Four. Old Ciano worried him. It *would* have been nice not to have to show up to see *him* again. Dr. Leigher could have him. For keeps.

Gansy squirmed his toes. He'd have to get back shortly.

"You can see what straits I'm under." Leigher had mellowed somewhat, had his guests drinking coffee from assorted not-very-hygienic drinking vessels. "By the time my initial, ah, appropriations came to an end, the bulk of my work here was finished—that is to say, the installation. But lately lack of funds has been most aggravating. There is equipment I need in order to bring about refinements, and I must admit that I'm glad to see some real cash at last. The other fellows that have been here seemed to think this place was a free soup kitchen. Promises, nothing but promises."

"Who were they?" Mr. Ciano inquired. "Do you remember their names?"

"I have a list somewhere," Leigher said. "I can't remember them all. William Clayfield, I think, and, uh, Sydney Finebaum was one. And then there was a fellow called Gatniche, and, ah, that escaped prisoner, what was his name? Felch? Or Velch?"

"Sidey Winebaum?" Mr. Ciano was surprised. "So this is where he's been!"

"Mr. Winebaum? Yes. I did a special routing for him, to pre-Revolution France." Leigher curled a disdainful lip. "My reward for my services was those two Louis XIV chairs over there."

"And Willy The Chopper," Carl asked, "what happened to him?"

"Willy The Who?"

"Clayfield, Willy Clayfield. Where did he go?"

"Oh, yes, him. He was the one that wanted a hiding place. Till the, ah, 'heat was off', was the way he put it, I think."

"What about his roll, did he take that with him?"

"He *did* have a bag with him. He was one of the few who gave me some recompense. He swore on oath that he would return in a couple weeks and pay me the balance, but he never did."

"Where did he *go*?"

"To somewhere around 1350. He's still there."

"Tell me," Mr. Ciano said, "I've been thinking—why do we have to wait the time here the same time that a person has there? Like Gansy, why can't you just pick him up four hours ahead and bring him straight back?"

"I don't know," Leigher confessed. "It's one of the problems I'm working on. It would seem simple, but there is an unavoidable and inseparable relationship be-

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tween the passage of subjective time for the transposer and for its user. Thus, to enjoy four hours there means to wait four hours here. This is one thing I wish to research further. Another is to obtain greater precision that I might not merely strike the correct month in the right year, but the very exact right minute upon a certain defined day. And in exactly the right place."

Leigher's eyes began to glow. "I need a lot more autocontrols and relays. And I need fully variable wall charts of the entire world, with a delineation-enlarger capacity that any point may be brought to at least one-to-ten, with full gravitational compensation and terrain evaluation, with the known characteristics at any period.

"The possibilities are tremendous, Mr. Ciano." Leigher for a moment had the shining vision before his eyes. He had the radiance of a dedicated fanatic. "A man could see the last stone being placed upon the pyramids, stand on the heights and see Rome burn, watch the Huns sacking and looting, see Michelangelo himself put the finishing touches to his David, see the Battle of Waterloo, see Prince Ferdinand assassinated. So many things, to be there, to see the things that made history! On the spot, authentic, no time wasted! To be there, just for the few minutes!"

Leigher paused, his face flushed, his glasses full of eyes.

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There was an impressive silence.

Leigher became aware that they were all looking at him in the same strange manner. His radiance faded and died, and his face reverted to its acid cast.

Seffan sipped his dubious coffee. "Sounds like it could be a sound commercial proposition," he said.

Sssss-sook, the chamber door closed. The orange light pulsed one-two-three. Five seconds. One-two-three. Five seconds. One-two-three—

Leigher went to the console, busied himself verifying that the auto-recall cycle was perfect. The date began to climb: 1690—1691—1692—93—94—

The constant hum that had been with them again began to rise in pitch. The high whine sang inside their skulls and squinched their eyes . . . then mercifully descended the scale, like a jet engine being throttled back.

The sound died to a low throb, a green flasher ticked. All eyes turned to the chamber door.

Flash, flash, flash. The suspense mounted as they waited for the door to open.

A long minute went by. A second minute started.

"What's going on?" Mr. Ciano cried. "Why doesn't it open up?"

"When going back into the past, arriving at a precise second is not essential," Leigher said, "but on recall it is vital to connect with the exact split second of present time. To be out of phase causes disturbance. It is something like an elevator slowing to match floor levels. Ah!"

Sssss-sook. The door opened.

Gansy tore off his face mask. He looked relieved. He couldn't limp out of the chamber fast enough. "The antidote, give me the antidote. I'm getting dizzy."

They gave Gansy a Louis XIV chair, and he slumped into it. Dr. Leigher calmly prepared the hypodermic.

Mr. Ciano keenly looked Gansy up and down, noting what looked like grass stains on his knees, the strange coat he was wearing, and the wide-brimmed hat with the droopy plume. Mr. Ciano himself stooped to wipe a finger along Gansy's shoes. The mud was still moist. Gansy, in fact, was quite damp; his hat quite heavy with soaking. He smelt of rain—and other things.

"You've been drinking!" Leigher accused. "You fool, if you'd got drunk, you might have passed out!"

Gansy struggled out of the coat to offer a bare arm. "It was cold there," he groused. "You dropped me in some kind of field, and it was raining on and off. I had to walk a mile before I met anybody."

Leigher dabbed alcohol on the presented arm, inserted the needle, emptied the syringe.

"I hope you're in time." Gansy

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sounded somewhat anxious. "I don't feel so good."

"You're all right," Leigher said. "What else have you brought back?"

"What else? I wasn't there long enough to get organized. What did you expect? When you got poison, you shouldn't get excited."

Coat and hat to one side, Leigher helped Gansy remove his traveling harness. "Didn't you see anything, do anything?"

"I didn't have time, did I?" Gansy retorted. "What was I supposed to do? It takes a day or two to settle in, find the best places, pick the best targets." He rubbed his knee. "And I caught a bench and nearly broke my leg."

Seffan went through the pockets of the coat—lace handkerchief, copper snuff box, a battered nosegay that had lost most of its fragrance, a large iron key, a tinderbox, some beads, two crumpled letters, loose pennies and a money pouch containing ten-and-a-half guineas and some silver.

"What's this?" Leigher tugged.

"Go easy! It's loaded, I think." Gansy freed the snag and removed the flintlock pistol from beside the more modern version in his belt. "I didn't want to take it off him, but you know how it is. I didn't want to have to shoot him just to borrow his coat for a spell. It was wet, man."

"I'm sorry." Leigher turned to Mr. Ciano with a shrug. "That's another thing I wish to correct, to select the most climatically propitious times. My work." He held out his hands. "There is so much to do!"

Mr. Ciano nodded. "I can see." But there was a new gleam in his eye.

They dickered about who would go next. Gansy went out to hide the car under a camouflage sheet.

No one would take on the poison trick. It was generally agreed that a few days would have to be spent in order to reconnoiter the ground and orientate to the past surroundings.

It was first thought that Seffan and Carl should go together. They were willing. But Mr. Ciano thought twice, and three times, and four times, and gnawed his lip. He did not trust Seffan, and began to trust him even less. And Carl had disappointed him recently. Seffan and Moke? Moke and Carl? The more he thought about it, the less he liked the combinations.

"Three days should be sufficient," Seffan said. "We can stake out the best prospects, get everything set for what the market will take—which should be plenty. They'll be wide open for anything. With our know-how we should be able to move in and mow the hay."

Mr. Ciano wriggled his fingers, tapping ash. He made his decision. "Carl and I will go. You will stay and keep an eye on things here."

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"What?" Seffan was surprised. "You are going yourself?"

"This is big," Mr. Ciano said. "I want to see for myself, firsthand. I want no foul-ups, and I want no mistakes. There seems need to establish some positive form of control at the reception end." He spat fragments of cigar. "The only way I can be sure that there is no deviation is to attend to the matter personally."

"But, Mr. Ciano . . ."

"No 'buts'. *I* will come back." He turned to the inventor/discoverer. "Dr. Leigher, you can send Carl and myself to some suitable place where we might study the conditions for a permanent rendezvous area?"

"You anticipate a regular traffic to one particular era? Ah." Leigher raised his eyebrows. "If someone remained to provide a permanent fix, yes. The continuity-gap remains constant. I can send any number of persons to match a current past-contact on the board." He played with a pen. "This is perhaps one reason why absconders invariably return their recall harness—it makes it extremely difficult to find them again."

"Well," Mr. Ciano mashed out his cigar, "you won't see my recall-harness without me in it. So—let's get going, shall we?"

"As you wish. I think you will find that 1640 was a very interesting year in London. Ah, two of you wish to travel together?"

"That's right, just me and Carl."

"Good," Leigher said. "That'll be another twenty thousand dollars, please . . ."

"Carl's has got a corner missing—will it make any difference?"

"No, it's only a casing. In here now, gentlemen."

And stiffly back-to-back, Carl and Mr. Ciano were put in darkness as *sssss-sook*, the chamber door sealed.

Primed to readiness, came the hum to shiver the nerve ends of their teeth, the closing of contacts. And at the key moment the throwing-in of the major circuits.

Bang! like the crack of doom, and the hum dropped to a steady pulsing, and Carl and Mr. Ciano were on their way.

One day passed, and another. And another.

Gansy was sent to town to get some supplies, and to order a heap of special components that Leigher desired. Leigher spent most of his time shut away in his workroom fooling around with a cabinetful of complicated wiring. Seffan and Moke played cards, Gansy joining them as available from his chores.

There was much private thinking, much silent pondering and speculation upon the whereabouts and doings of the couple who had departed. There was some temperamental disparity in the group remaining. Moke had the limited out-

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look of a hired gun, Seffan the devious mind of an intriguer. Gansy was now more or less a supernumary, a small man who'd found himself a good thing but was a degree nervous of his new-found "partners." Leigher lived in a world of his own.

Towards the end of the third day, the orange light blipped once, twice, three times. Seffan hastened to fetch Leigher, but Leigher had a relay to his workroom and was already on his way.

Ssssss-sook. Leigher went through his own planned drill.

The drag of idle waiting was swept away, and in two minutes the tension had hearts pounding and breath hanging shallow.

Come on, come on!

It seemed ages before *sssss-sook*, the chamber door slid open.

There was no one there.

Leigher ran forward, but Seffan beat him. On the floor of the chamber was a single harness and, attached to it, a letter.

Seffan scooped up the bundle, tore the letter free, opened it. The paper felt gritty. He read the inky scrawl: "Doc Layah, you were right. Mr. Ciano had bad luck, is at the bottom of river. Send nobody else. Don't follow me. Everything be O.K.—C.M."

Seffan was bewildered. "What . . .? What . . .?"

Leigher took the letter from his hands, read.

Seffan looked at the harness. Yes, it was Carl's all right, the recaller-button case had a chipped corner.

"M'yah." Leigher handed the letter back. He seemed not the least perturbed. "That's the way it happens. The good old days are really good—being there, we know that the future is assured. It is known that the world will not end tomorrow, and the good things of life are plentiful."

"Mr. Ciano at the bottom of the river." Seffan was stunned. "Carl wouldn't dare do a thing like that."

"It may have been an accident," Leigher said. "Or perhaps he didn't want competition Or perhaps didn't like being told which apple to pick in an overloaded orchard."

"Yeah?" Seffan snarled. "Well he won't get—" He stopped. And truly Carl was beyond his jurisdiction.

"If you'd like to go back to his time, I still have a fix on Mr. Ciano's recaller. Carl may have thought, erroneously, that the water would destroy its efficiency."

"Can you bring Mr. Ciano back?"

"Not if he had the recaller in his pocket. I can override the safety guard, but all we might get could be just a portion of his jacket, say."

"Carl!" Seffan threw aside the harness. "He'll pay for this!"

"While Mr. Ciano's recaller is locus operable, we can at least know where Carl is in time, if not in place."

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"Ah." Seffan smote his fist. "Yes." His sense of fidelity and loyalty had been outraged. The Code had been broken. What would other Chiefs have to say about this?

Seffan took respite to reflect. Yes, what *would* the Chiefs have to say about this? Would they believe him? Yes. Would they? What if they didn't? Mr. Ciano had been his boss. Seffan's mind came up with a skitter of awkward questions. Blame. Fault. Carl scot-free. They wouldn't like that.

Seffan went cold. He swung on Leigher. "Look what you've done!" Could he take Moke, a spare harness, bring Carl back, alive or dead? How reliable would Moke be? "Blast you!" This was a job for the organization. How many to send back? How trustworthy the enforcers, with no living network to keep them in line?

Seffan stamped. He saw trouble ahead. With his patron, guide and mentor gone, his security was shattered. Questions, too many questions to answer. And Carl, at peace forevermore, laughing at them.

Moke spoke. "Thinking of going after him?"

"No," Seffan said. He thought of Elaine. Never satisfied, everlastingly wanting things. He'd already thought about the chances of losing her, half-seriously. No more Elaine. Or Charlotte, either. Women tired a man. A fresh start. Why not? Others appeared to revel

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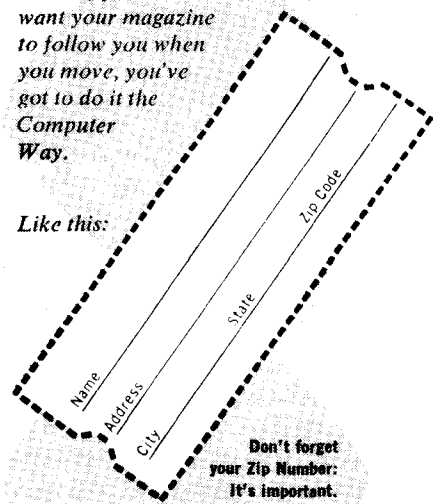

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in it. If Carl could prefer it, choose it, find it so plainly desirable . . . "No," Seffan repeated, "I'm going back to a different time." It was obvious. It would be refreshing, exhilarating, a brand-new life. With his brains . . .

"Huh? What about me?"

"You can suit yourself."

Seffan got the valise, came to drop it at Leigher's feet. "My passage money is in there." He stooped, retrieved the bag, opened it to remove two boxes of cartridges. "I might need these." He dropped the bag again. "Doc, I want to go back someplace. Make it around," he guessed at a number, "1773."

"Now hold it," Moke said grimly. "You ain't going nowhere. You're not leaving *me* here to carry the baby."

"Oh? Well, I don't want *you* where I'm going. You make your own arrangements."

"Yeah?" Moke's gun was loose in his hand. "I'm as entitled to that passage money as you are."

Leigher, perhaps mollified by his increased income, or sensitive and fearful that a shooting match might damage his equipment, interrupted, "Please! There is no need to fight. Under the circumstances I shall be willing to accommodate both of you for the single fee." He sighed. "I understand the situation only too well. It is happening all the time." Leigher kicked the valise to one side. "I shall do my best for you both." He sounded weary suddenly. "If you would just tell me where you would like to go . . ."

Seffan stuck with his random selection of 1773. Moke opted for a nearer era—he wanted to go back only as far as Prohibition, a great time to be alive.

In due course they each in turn entered the transposer chamber, and so dropped into history.

Gansy lived like a king—Leigher was quite indulgent with him. Gansy was one who always came back.

The Mob tagged Gansy, twisted his arm. Gansy was forced to talk. He introduced other high-ranking officers to pester Dr. Leigher. The good doctor's equipment became more sophisticated. Leigher professed unhappiness at the service he was obliged to afford persons who owned not the least of altruistic motives—but they did pay promptly, and in cash, without fussing over minor details such as receipts and tax-duties. And they were discreet.

But all good things come to an end.

Much of the folding money that Gansy got to spend while living it up in Miami, turned out to be part of the ransom that had been paid to the much-wanted kidnaper of Bernice Bernousie. Which little thing brought Gansy very smartly

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to the notice of the law. And from there it was but a step to making everything legal.

"A time-and-space transposer. Fantastic." Federal Agent Dixel surveyed the plant. The batteries of dials, screens, knobs and switches, gleamed and winked back at him. "What a project!"

His fellow agent, Gordon, stepped gingerly into the transposer chamber. "You said it. What a racket, sending hoods into the past." He mulled the thought. "One way of getting rid of them, I guess."

Dixel shook his head, marveling at the intricate machinery. "Wired every piece himself. The man was a genius."

"He'd have been better if he'd used his talents to serve society." Gordon mulled *this* thought over. "Maybe he did, at that. Another one and he'd have had a round forty taking his escape trail. From as low as five thousand bucks. That's a small price to pay to raise hell sometime else. Hey! don't touch anything! I don't want to go any place!"

Dixel laughed. "Take it easy, Johnny, the power's off." He came over to the chamber. "This place is sealed, right? And if we want to go anywhere, we'll have to do it in our own time."

"My wife would miss me," Gordon said simply, "and the way this thing works she might have trouble collecting the insurance."

Dixel peered. "Is that an inspection hatch up there?"

"Huh? Yes, it looks like it." Gordon tested the rings of radiation bars. "Wouldn't grab these when they're hot. It must have been like an oven in here." But cold, he found that they made a serviceable ladder.

Gordon climbed. He tested the hatch, found that it moved easily to one side. He poked his head up through, and a hand with a flashlight.

"What's up there?" Dixel asked. "A valvo transistorium?"

"Uh-huh." The torch beam played.

Satisfied, Gordon descended. He did not feel comfortable in the chamber and felt that he had overcome his reluctance sufficiently for this investigation.

"Well? What did you see?"

"An air-bed, a refrigerator, a hose and a couple buckets, a clothes closet and spare harness things, and a paperback library." Gordon stepped out and dusted his hands. "Friend Gansy's hideaway." He scanned the laboratory. "Beautiful. A time machine. He could afford it. Tin, flashbulbs, and imagination." He turned to gaze somberly at the floor of the chamber. "And a trapdoor over the deepest abandoned mine in the state of Arizona . . ." ■

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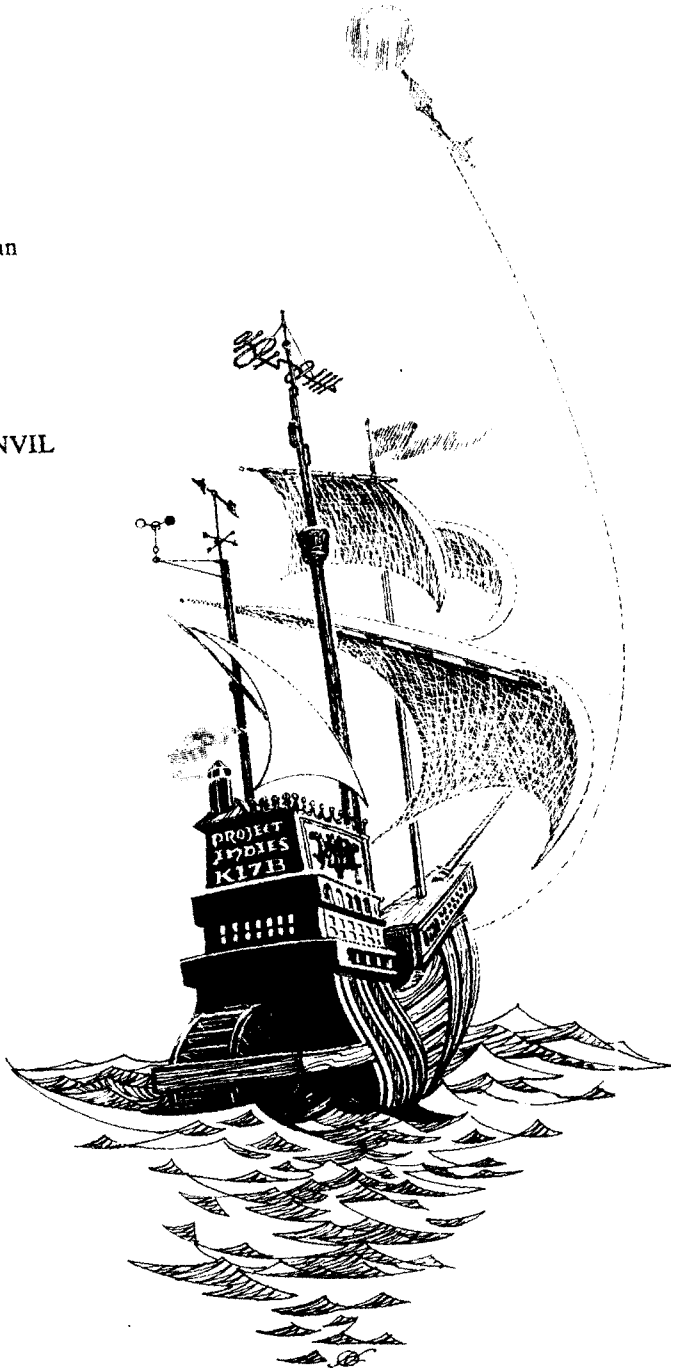
apron chains

Sometimes one man can change a world— and it's also possible that his very greatness stops needed change!

CHRISTOPHER ANVIL
Illustrated by Kelly Freas



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Fernando Columbus, Jr. peered into the viewplate at P. Hernandez, one of his best mariners. Hernandez's voice came out the horn of the all-hail to one side:

"Mr. Director, I have the seventeen bottles of seawater, from the specified depths."

"Good, Hernandez."

"And I have charted the wind-speed at all the different prescribed altitudes, using the gas sack as directed."

"Excellent."

"Also, I have conducted the current-mapping tests as prescribed."

"Very good, Hernandez."

"My equipment state is A-1."

"Fine."

"My personnel state is A-2. There has been a little grumbling."

"That is to be expected, at this stage. It will pick up to A-1 again as soon as you start back."

"Ah . . . I would like to make a request, Mr. Director."

"Yes?"

"I . . . ah . . . Mr. Director, I do not wish to return to port just yet."

Project Director Columbus winced, as with a headache.

"*Why?*"

"Well, sir, I—That is, I think—Mr. Director, I *know* I can make it *all the way*."

The director gripped the table edge. *This* again.

"Look, Hernandez, every second mariner we send out *knows* he can make it all the way. There's even a name for it: 'Far-end syndrome.' Back when Indies Project started, my own great-uncle, one Christopher Columbus, knew *he* could make it 'all the way.' "

Hernandez looked baffled. "He was a mariner?"

"One of the first. They didn't have much education in those days, believe me. And that was using the old K-1 rig, pure sail power, and if you got becalmed, you just sat there. Well, he got this same crazy idea, he was going to go on, and on, and on, *all the way across*. Velasquez was director back then, and they had a terrific argument. Uncle Chris tried to throw the all-hail overboard, but the crew stopped him. Velasquez appointed the first mate to take over—that's what they called the alternate mariner in those days—and that was that. If he *had* gone on, he'd have had to go *four times as far as he had gone already*, in order to reach the Indies. He wouldn't have made it. His stores were inadequate. Equipment state was bad. Personnel state was terrible. All the same, he 'knew he could make it.' If Marquesas had been a few years later inventing the all-hail, or if the Venetian School had been a little slower getting a geographical analysis of the problem done, it would have been 'Good-bye, Uncle Chris.' Luckily for him, Velasquez was on hand to straighten the situation out before it was too late. Since then, we have had others. Ordaz for instance. Ap-

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parently he *did* go on. Lost without a trace. That's why we have alternates, to prevent such foolishness."

Hernandez said weakly, "I saw a sea gull."

"You've been in a storm. It could have been blown from an island somewhere."

"Uh . . . I can sort of . . . 'feel' land—lots of land, up ahead. It's sort of *looming* there, almost. I . . . I *know* I can make it."

The director drew a deep breath. His voice came out low, patient, and determinedly sympathetic.

"Hernandez, our advances are made by the patient labor of many people, not by any one man. I realize how you feel. It does credit to you. But your achievement on this is already a significant contribution. There is no possible purpose in your attempting to complete the voyage to the Indies. Geographical analysis demonstrates that the direct sea route is *longer,* not shorter, than the route around Africa. In place of the curving route around the African continent, you have instead the whole bulge of the Earth to travel across. Consequently, there is *no conceivable economic advantage* in this route. That is why Indies Project is a scientific fact-gathering operation, under strict budgetary control, and on a minimal-risk basis. The gains have been, and will be, made in improved ship-design, better charts, and refined meteorological and oceanographic analysis. These gains can be realized in a deliberate and systematic way. What we need is the *methodical performance of assigned tasks.* Heroics, such as those of the unfortunate Ordaz, are unnecessary. It would be pointless—wouldn't it?—to try to start now a voyage that is still longer, from where you are at present, than it would have been if, when you started out, you *had* gone around Africa?"

"I . . . I guess so." Hernandez glanced away at the horizon, then shrugged. "I guess you're right."

"All right. The objectives of your mission are completed, Hernandez. I suggest you start back."

Hernandez scratched his head, then nodded, and said, "All right, Mr. Director." He dropped the cover over his viewplate. The *snap* from the all-hail told the director the connection was broken. The director shoved back his seat, to see Diaz, the medical man, leave his big viewplate.

Diaz said cheerfully, "Typical far-end syndrome. But Hernandez is in good shape, physically and mentally. His color is good. Eyes are clear. Disposition is basically lousy, of course, but whose isn't?"

The director smiled and sat back

"No harm then, in letting him complete the mission?"

"No. None. Do him good."

"What do you suppose causes this 'far-end syndrome?' "

Diaz pulled up a chair. "It's be-

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yond me. As long as we can get them out of it, I guess it doesn't matter. Oh . . . I suppose it's actually a form of psychic inertia. After you go on and on, and on, *toward* the Indies, I suppose there's a natural hesitation to turn back, away *from* the Indies. If it weren't for Marquesas' all-hail, there's no telling how many we'd lose."

The director nodded. "When you stop to think of it, it's amazing how much we owe to Marquesas—and to the Venetian School, of course. But then, without Marquesas, I doubt that the Venetian School would have hung together."

"Probably never have been founded in the first place." Diaz sat back, hands clasped behind his head. "It's a funny thing, when you think of it, how much the world has changed in roughly the past hundred years. And when you trace it back, sooner or later, you usually arrive at one man—Marquesas."

The director nodded.

"I read an interesting piece on that very topic. It was called, 'The Unvenetian World,' or something like that. The basic assumption was that Marquesas had died in that shipwreck, instead of barely getting ashore near Venice. It then followed, and it was logical, that the Turks would have taken Constantinople, and Europe would still be split up in odd bits and pieces, all fighting each other. The steam carriage, the all-hail, the viewplate, the snafaraz, the flashscraper—all of that would have gone down with Marquesas. If Science *had* started up, *without* Marquesas, it would still have run smack into the Church. The likelihood of another person with both scientific and diplomatic genius was nil. Without Marquesas' particular viewpoint, many of those devices *never* would have come about. *Other* things would have been devised, filled the need, and eliminated the search that led to their discovery. The whole world would have been different. It's an incredible thought."

"No more incredible than the facts. Did you know, when he made it ashore, Marquesas was too weak to drag himself out of the water? A peasant girl, waiting for her lover, saw him and pulled him out. Now, if he had come in at a slightly different place, if the girl had been looking the other way, or if her boy friend hadn't been late because of taking a wrong turn on the path—good-bye, Marquesas. Everything *would* have been different."

The director nodded.

"My great-uncle Chris would have gone 'on to the Indies,' for one thing. But then, you wonder, could things actually have turned out differently. *Could* Marquesas have drowned? Could the peasant girl's boyfriend have taken the right turn on the path? *Could an individual create such a change in history?*"

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Diaz nodded. "I would say, *that* was such a slender, delicately-balanced thing, that . . . yes, *that* could have turned out differently. But *now*, could a similar individual decision, or even accidental action, at the *present* day, have an equal effect on the course of history?" He shook his head. "No. Quite impossible. We have, after all, reached a time when the course of history is already determined. The mass-effect of innumerable tendencies quite outweighs any possible individual action. It's too bad for romance, I suppose, but this *is* the Day of the Organization. Individuals don't matter much, one way or the—"

The all-hail gave its whistling note, signifying contact, and the director sat up.

"I wonder who *that* is."

"Not Hernandez again, let's hope."

"Surely not . . . *Contact!* India Project, Director Columbus speaking."

"*Contact!* Tenochtitlan, Mariner Ordaz speaking."

"Who? *Ordaz*? But you didn't—we haven't heard from—"

"That's right. I *didn't* obey your damned silly schedule. *I went on.*"

"Wait a minute, now. Hold it. By now you must be almost to Cathay. What's your equipment state? Personnel state?" He turned aside. "Quick, Diaz! Get him on the big viewplate! He sounds in bad shape. Probably cracking up . . . Contact! *Contact!* Are you still there, Ordaz?"

"Yes, I'm here. I *told* you, I could sense land ahead!"

"Yes, yes. Certainly. Of *course*, you could, Ordaz. Now, calm down. Where is the viewplate? The *viewplate*, Ordaz. Do you have it? If you are too weak to find your position, just lay the plate in its gimbaled on-deck mount, so the leads don't get crushed. Leave it face up, and we'll roughly calculate your position for you, and let you know when we have it. Now, don't worry about our punishing you for disobeying orders. We view your action purely in a clinical sense. You were temporarily insane, that's all. So just relieve your mind about *that*. We want to *help* you, Ordaz."

Ordaz's voice came across somewhat faint, as if he had turned his head to speak to someone else.

"*Listen* to that. What did I tell you? Did you hear it?"

"Uncover the viewplate. Let's see what happens then."

"Just a minute . . . *Contact*! Are you there, Mr. Director?"

"I am here, Ordaz. But the question is, where are *you*? Now, we are prepared to do all we can. But you must get a grip on yourself. You must overcome this hysteria. Do not fear because of the immense spaces surrounding you. *We are with you!* Take hold of your courage with both hands! Get a grip on yourself! We will face this *together*!"

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A bad word came out the horn of the all-hail.

The viewplate flared with color.

The director found himself looking down from a height at a city of low blocky buildings topped with parapets, with towering pyramids rising on every hand. The streets were filled with bustling people, hurrying to and from a great square where a busy trade was being carried on, while swift canoes bearing garden produce flashed up the canals that interlaced the city. The canals led in from a big lake where flowery islands floated, rising and falling with a rippling motion on the gentle swells. Snow-capped volcanoes rose in the background, and the turning of the viewplate brought new scenes to view, to leave the director dizzy.

"Mr. Director," came Ordaz's voice, "how many times have you told us the purpose of the project was to accumulate data in order to improve our ships and our knowledge of the ocean. But *what for*, except to get some use out of the knowledge? I could never get a clear answer to that. Finally, I saw the reason. The human race, Mr. Director, has a short memory, and is ruled by fashion. The Greeks, for instance, tried to reason all things out in their heads. Experiment was *not in style* with them. We, having discovered the value of experiment, are busily accumulating mountains of data. With us, you see, *reason*, as such, *has gone out of style*.

"Now, once I saw that, I realized that your arguments about Science, and collecting data, were merely a *statement of what was in fashion at present*. Like the ladies' latest mode of piling up their hair. It had nothing to do with sense, utility, or anything else. It was just *the style*. It would be sacrosanct until it got so overblown it was ridiculous to everyone, and then it would be discarded—the good part along with the bad—and some *new* style would come in.

"Well, I hope you will excuse me, Mr. Director, for not waiting for all that to take place. I just decided to use a little reason, and a little trial-and-error, that were in style back before reason, and a little intuition, that was in style back there somewhere, and a few scientific data that looked useful—there's nothing wrong with Science, as such—and just try it and *see what happened*. Now, what do you suppose? The things that were out of fashion worked just as well as those *in* fashion. Even prayer works, Mr. Director. Fashions don't sway God any more than they do facts."

"Yes, yes. I'm sure—"

"And so, we just continued west. It was just a short distance, compared to what we had already covered, and here we were."

"Here you *what*?"

"Here we were. You see the

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scene. *We found a new continent,* or perhaps an old one. Perhaps this, indeed, is fabled Atlantis."

The director craned around to look at Diaz, staring wide-eyed at his own big viewplate.

"*Hsst*! Diaz! What do you make of this?"

"I don't know. It sounds like delirium. But—"

The director said to Diaz, "Do you suppose a return to routine might straighten him out?"

"Ah . . . I don't . . . I don't know."

"Worth a try." The director straightened up.

"*Ordaz!*"

"Yes, Mr. Director?"

"Enough of this nonsense. All this chatter is to no purpose. Now, do you have your samples in the water bottles? Have you taken your current readings faithfully? Is your gasmaker still in condition to send up the gas sacks? All of this is very important, you know. Science advances insensibly by many little steps with the accumulation of data. Your small bit is part of the very—"

"Mr. Director, *we have discovered a continent!* Surely that is more important—"

"If true, it would admittedly be one more datum. However, Cathay is *not* a new continent."

"This is *not* Cathay."

"Not the *known* part of Cathay."

"Not Cathay *at all*!"

"The projected course, allowing for time-lapse, places you near *Cathay.*"

There was a brief silence. Then Ordaz said, "Did I mention that when we arrived here, we were greeted as gods? For a practical man, this puts quite a useful handle on the situation."

The director craned around at Diaz.

"Off his head?"

"Sounds like *it.* Poor devil. After a voyage like that, who can wonder?"

Ordaz said, "Did I also mention that this place groans under the weight of gold in it? That my friend, Emperor Cacama II, has a tremendous army, and powerful fortifications, and that his ancestors in Taxcuco gave great emphasis to the arts and sciences—emphasis which is starting to bear fruit. You regard all this as of no more significance than so many water bottles?"

"No, now of course, Ordaz, your little bit, added to the rest, is significant."

" '*Little bit*' ?"

"The *important* thing, however, is to complete your voyage as planned. Do not be concerned that you will suffer any punishment, or reduction in grade . . ."

"*Punishment!*"

". . . As we will simply regard this, as I say, in a clinical light. Temporary insanity. That is, as

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long as you straighten up *now*. But our concern for your welfare, while very great, is nevertheless limited by—"

"So you expect us to just drop everything and fill water bottles, eh? What can I say to get it across? Did I mention that we are not only regarded in the light of gods or demigods, but that some really beautiful maidens—"

Diaz said pityingly, "Completely off his nut. Typical. The whole crew is probably the same."

"I suppose," came Ordaz's voice sarcastically, "that our discovery will not change your schedule at all?"

"Certainly not. The direct voyage, even to Cathay, is too long to be practical—as witness your own experience."

"And the fact that Cacama, purely in self-defense, is building a big navy—"

"Very interesting. But more interesting yet, your location, off Cathay, would fill a gap in our charts, and—"

"*Why waste breath*?"

The viewplate went blank, and the *snap* from the all-hail told of the breaking of the connection.

"Poor fellow," said the director. "There goes his last link with sanity."

"Too bad," said Diaz, "that his account was untrue. For a moment there, he had me wondering."

The director shook his head.

"No, I didn't believe him for a moment. It was easy to tell that what he said was false. It *had* to be false. It would have been *too big a discovery*. Advances now are made only by small steps, owing to the enormous extent of our knowledge, which dwarfs any conceivable new discovery. After all, when one is whirled across the continent at the speed of steam, it is obvious, isn't it, that nothing could go much faster? Where are the new discoveries to come *from*? And there is a further proof."

"What is that, sir?"

"Never have we had so many devoted highly-trained workers laboring in so many fields, and guided by men of such impressive qualifications. If any startling new revolutionary discoveries were to be made, *they* would make them."

Diaz nodded, and selected a chair.

"It must," he said, "have been wonderful to live, like Marquesas, in a great age of discovery."

The director nodded and sat back with a sigh.

"We were born," he said, "in the wrong era. This is just not the right century for it. Marquesas had all the fun." ■

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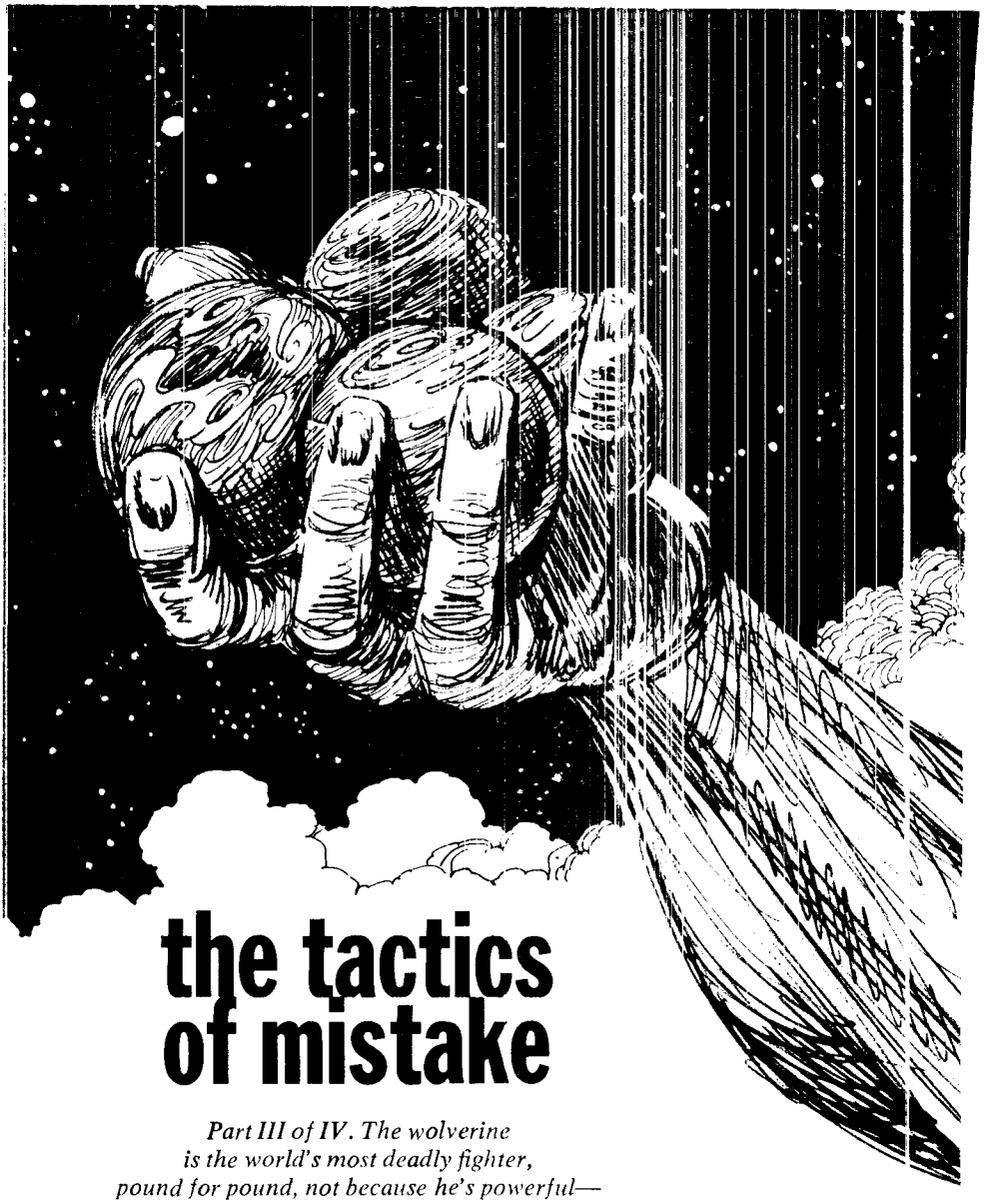

the tactics of mistake

Part III of IV. The wolverine is the world's most deadly fighter, pound for pound, not because he's powerful— but because he's exceedingly agile, and fanatically vicious— and small armies need not lose!

GORDON R. DICKSON
Illustrated by Kelly Freas

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SYNOPSIS

"The young lieutenant colonel was drunk, apparently, and determined to rush upon disaster . . ."

The lieutenant colonel in question is Cletus Grahame, an officer in the Western Alliance, an aggregate of former Earth nations who dispute control of that world with the Coalition—another former nation group. The rivalry of the Alliance and the Coalition has recently extended to colonized worlds off-Earth with the two Earth political giants backing opposing sides in inter-colony wars.

The scene of Cletus's apparent drunkenness is the dining room lounge of a civilian spaceship en route to the colony world of Kultis where the Alliance has an expeditionary force helping the Exotic colony of Bakhalla against the Coalition backed colony of Neuland. Cletus, limping on a half-prosthetic knee, sits down without invitation at the table of Dow de-Castries, Secretary to the Outworlds for the Coalition, also en route to Kultis.

At the table also are Eachan Khan, a full colonel in the Dorsai mercenaries, his daughter Melissa Khan, and an important Exotic named Mondar the Outbond, homeward bound to Bakhalla. Cletus reveals the fact that he was the former head of Tactics at the Alliance Academy. He initiates a duel of words with Dow and ends up engaging the Outworld secretary in a form of shell game with sugar cubes and coffee cups. Dow apparently wins, but his earlier attitude of cynical amusement at Cletus's actions suddenly changes. The Secretary moves to stop and question Cletus—who is about to leave the table—and Melissa has to plead a headache to get Cletus away.

Outside the dining room however, Melissa warns Cletus to stay away from Dow; also, from herself and her father, whom a wild theorist like himself can only endanger. Sadly, Cletus agrees.

Once landed at Bakhalla, however, Cletus proves his combat-abilities—in spite of the fact he is ruled out of duty as a field officer because of his knee—in saving Eachan, Melissa, Mondar and himself from an attack by Neulander guerrillas. He meets General Bat Traynor, his commanding officer and allows himself to be sent out to stem a new guerrilla infiltration with inadequate military force. The general, who has asked for jungle-breaker tanks and got Cletus instead, plainly hopes Cletus will make a mess of things, and can, therefore, be shipped back to Earth.

That night at a party at Mondar's Cletus reencounters Dow de-Castries and the two men acknowledge their enmity. Later, with Mondar, Cletus has a paranormal experience in which he and Mondar each seem one in a line of fig-

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ures stretching before and behind them. Behind Cletus is a man with one arm, and the last figure in his line is a powerful old man in Fourteenth Century Italian armor.

Mondar pleads with Cletus to become an Exotic and develop his obvious unusual mental and physical abilities. Cletus refuses. The next day he goes out to capture the guerrilla infiltrators, and talks the field officer supplied him—a sullen, hypersensitive first lieutenant named Bill Athyer—into taking most of the troops to guard two river crossings. Cletus, given only seven men to guard three other crossings, actually intercepts and captures half the guerrilla force, turning the other half back on Athyer. However, in doing so, his bad knee is injured, and he must go to the hospital.

Coming out of the hospital several days later, he finds himself now in good reputation since his capture of half the infiltrators. (Athyer has let his half escape, after all.) Bat, on Cletus's intercession and advice, transfers Athyer to become liaison officer at the Exotic library in Bakhalla, rather than court-martialing him. Cletus asks to set up an office for making future estimates of enemy activity, and Bat is in no position to refuse. Accordingly, with the help of his aide, Lieutenant Arvid Johnson, Cletus sets up the office, booby-trapping it to hold anyone investigating the office after-hours.

The loss of the infiltrators have put the Neulanders in the position of coming up with some other military success to celebrate the visit of Dow. Without authority Cletus sets up a further trap—for guerrilla saboteurs and supplies coming into Bakhalla down the main river channel—with the help of an underwater bulldozer in the hands of a navy officer on harbor duty at Bakhalla.

They capture a surprising number of infiltrators and supplies and return in triumph to Bakhalla, where, meanwhile Cletus has talked Colonel Eachan Khan into training his Dorsai mercenaries as jump troops.

The next day Bat Traynor calls Cletus into his office and explodes about the unauthorized expedition after the river infiltrators. Cletus, however, talks Bat into flying up to Etter's Pass and explains that the pass could be considered an excellent jumping-off point for an invasion of Neuland by the Alliance forces in Bakhalla.

Bat explodes again. Such an invasion is not even a military decision—it would have to be decided by political authorities back on Earth.

Cletus calms the general. He points out that they need only pretend to threaten invasion via the pass. Neuland, in self-defense, will have to respond to it—particularly in light of their recent military failures. Then, when the Alliance

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forces demonstrate that invasion was never their intention, the only way for Dow and the Coalition to save face will be by throwing all the blame on Neuland and—as evidence of the fact the blame is real—cutting Coalition aid to Neuland Colony; a situation that can only be to the advantage of Bakhalla, and Bat.

Caught between admiration of the plan and suspicion of Cletus, Bat finally gives in and agrees that Cletus can move—no regular Alliance troops—but Eachan Khan's Dorsai mercenaries, up into the Etter Pass area, ostensibly for more jump training. This is done.

The Neulanders, in response, gather almost their total regular ground forces on the opposite side of Etter's Pass. Cletus begins to pull out his Dorsais, but at the same time sends Bat word that something top secret has been discovered which they should discuss secretly in Cletus's office. After some argument, Bat agrees over the phone to come secretly to the office. Cletus hangs up and leaves—setting the booby traps of the office to entrap and hold prisoner whoever enters it.

Meanwhile, the Neuland troops, having seen the Dorsais leave, are pouring through the pass with the clear intent of overrunning the Bakhallan town of Two Rivers, just below the pass.

As a result Cletus orders his Dorsais back in to Etter's Pass. Colonel Dupleine, Bat's second-in-command, protests. But Cletus is under Bat's orders only, in this matter; and Bat—by now trapped in Cletus's office—cannot be found. He drops the Dorsais as jump troops in the rear of the Neulander forces attacking Two Rivers Town, and at the same time directs the naval officer Wefer Linet to dam the river below the town with the underwater bulldozers. The Neuland troops, caught between rising waters and the Dorsai fire from the heights of the bluffs behind them, are forced to surrender, en masse. Neuland is left, essentially without military forces, by this one victory.

Cletus however, in going in with the jump troops, has at last badly damaged his part-prosthetic knee. While he is still unconscious in a room of the Dorsai HQ at Two Rivers, a physician flown up from Bakhalla examines him.

"How is it, Doctor?" asked Colonel Eachan Khan, sharply "It's going to be all right, isn't it?"

The physician shakes his head and looks at Eachan.

"No, it isn't," the physician says "This time he's going to lose the knee."

Part 3

XVI

"Prosthetic knee and ankle joints—in fact, prosthetic lower limbs—" said the physician

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patiently, "are really excellent. A couple of months after you've adapted to the prosthetic unit, you'll find yourself almost as mobile as you were before with that limp. Of course, no one likes to face the thought of an amputation. But—"

"It's not the thought of an amputation that worries me," interrupted Cletus. "I've got things to do that require two flesh and blood legs. I want a surgical replacement."

"I know," answered the doctor. "But remember we ran tests on you and you've got an absolute level of rejection. All the evidence is that it's a case of psychological, not physiological, rejection. If that's the case, all the immune-suppressant drugs on the list can't help you. We can graft the leg on but your body's sure to reject it."

"You're sure it's a case of psychological rejection?" asked Cletus.

"Your medical history shows you have a uniformally successful resistance to hypnosis, even under ordinary drugs," the doctor answered. "We find that kind of resistance almost always in people who exhibit psychological rejection of grafted organs. And whenever it's found we always, without exception, have psychological rejection. But just to put it to the test, I've brought along one of the new synthetic para-hypnotic drugs. It leaves you conscious up to safe levels of dosage, but it absolutely anesthetizes volition. If you can resist hypnosis with that in you, then the resistance is below the levels even psychiatry can reach. It's probably a genetic matter. Do you want to try it?"

"Go ahead," said Cletus.

The doctor fastened the band of a hypospray around Cletus's forearm, with the metered barrel of the drug poised above a large vein. The level of the liquid in the barrel of the spray was visible. Resting his thumb and little finger on Cletus's arm on either side of the band the doctor placed the tip of his forefinger on the spray button.

"I'll keep asking you your name," he said. "Try not to tell me what it is. As you continue to refuse I'll keep stepping up the dosage level. Ready?"

"Ready," said Cletus.

"What's your name?" asked the doctor. Cletus felt the cool breath of the hypnospray against the skin of his forearm.

Cletus shook his head.

"Tell me your name?" repeated the doctor.

Cletus shook his head. The cool feeling of the spray continued. Slightly to his surprise, Cletus felt no lightheadedness or any other indication that the drug was working on him.

"Tell me your name."

"No."

"Tell me your name . . ."

The questioning continued and Cletus continued to refuse.

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Abruptly, without warning the room seemed filled with a white mist. His head whirled, and that was the last he remembered.

He drifted back into a weariness, to find the doctor standing over his bed. The hypospray was unstrapped from his arm.

"No," said the doctor, and sighed. "You resisted right up to the point of unconsciousness. There's simply no point in trying a transplant."

Cletus gazed at him almost coldly.

"In that case," Cletus said, "will you tell Mondar the Exotic Outbond that I'd like to talk to him?"

The doctor opened his mouth as if to say something, closed it again, nodded and left. A nurse put her head in through the door.

"General Traynor is here to see you, Colonel," she said. "Do you feel up to seeing him?"

"Certainly," said Cletus. He pressed the button on the side of the bed that raised the head section, lifting him up into sitting position. Bat came in the door and stood beside the bed looking down at him, his face like a stone mask.

"Sit down, sir," Cletus said.

"I'm not going to be here that long," said Bat.

He turned about to close the door of the room. Then he turned back to glare down at Cletus.

"I've just got two things to tell you," he said. "When I finally smashed the door open on the arms locker in your office and got a gun to shoot the hinges off the door, it was Sunday afternoon, so I made sure I got secretly out of town and phoned Colonel Dupleine quietly, before I made any fuss. You'll be glad to hear, then, there isn't going to be any inquiry. Officially, I had a slight accident Friday afternoon a little ways outside of Bakhalla. My car went off the road. I was knocked unconscious and pinned in it. I wasn't able to get out until Sunday. Also, officially what you did up at Two Rivers, in capturing those Neulanders, was done at my orders."

"Thank you, sir," said Cletus.

"Don't butter me up!" snarled Bat, softly. "You knew I was too bright to go around raising hell about your putting me out of the way, until I'd found out what the score was. You knew I was going to do what I did. So let's not play games. You locked me up and nobody's ever going to know about it. But you captured two thirds of the Neuland armed forces and I'm the one who's going to get most of the credit, back in Geneva. That's the way things stand; and that's one of the two things I came to tell you."

Cletus nodded.

"The other thing's this," Bat said. "What you pulled off up there at Two Rivers was one hell of a piece of fine generalship. I can admire it. But I don't have to admire you. I don't like the way you work.

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Grahame, and I don't need you. And the Alliance doesn't need you. The second thing I came to tell you is this—I want your resignation. I want it on my desk inside of forty-eight hours. You can go back home and write books as a civilian."

Cletus looked at him quietly.

"I've already submitted my resignation from the Alliance Military Service," he said. "I'm also giving up my citizenship as an Earth citizen. I've already made application for citizenship on the Dorsai; and it's been accepted."

Bat's eyebrows spread. For once his hard, competent face looked almost foolish.

"You're skipping out on the Alliance?" he asked. "Completely?"

"I'm emigrating, that's all," said Cletus. He smiled a little at Bat. "Don't worry, General. I've no more interest in making public the fact that you were locked in my office over part of the weekend, than you have. We'll assume a Neulander spy got into the office, found himself trapped and managed to break his way out."

Their eyes met. After a second, Bat shook his head.

"Anyway," he said, "we won't be seeing each other again."

He turned and left. Cletus lay silently gazing at the ceiling until he fell asleep.

Mondar did not show up until the following afternoon, and he apologized for not coming sooner, when he did arrive.

"The message you wanted to see me was sent through the regular mail," he said, sitting down in a chair at Cletus's bedside. "Evidently your good physician didn't see any urgency in your asking for me."

"No," said Cletus, "it's outside his area of knowledge."

"I think he assumed I'd have to tell you that I—or we Exotics, that is—couldn't help you, either," said Mondar, slowly. "I'm afraid he may have been right. I called the hospital after I got your message and talked to someone I know on the staff here. I was told you've got a problem of almost certain psychological rejection of any organ graft."

"That's right," said Cletus.

"He said you thought that perhaps I . . . or perhaps some other Exotic, working with you . . . could succeed in overcoming such a psychological reaction long enough for a healthy leg to be grafted on you."

"It's not possible?" Cletus watched the Exotic closely as he spoke.

Mondar looked down and smoothed the blue robe covering his crossed knees. Then he looked back up at Cletus.

"It's not impossible," he said. "It'd be possible in the case, say, of someone like myself, who's trained in the areas of mental and physical

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self-control since he was a boy. I can ignore pain, or even consciously will my heart to stop beating—if I wish. I could also, if necessary, suppress my immune reactions—even if they included the kind of psychological rejection that afflicts you. Cletus—you have a tremendous amount of native talent, but you haven't had my years of training. Even with my assistance you wouldn't be able to control the rejection mechanism in your body."

"You're not the only one who can ignore pain," said Cletus. "I can do that, too, you know."

"Can you?" Mondar looked interested. "Of course, come to think of it! Both after your first time up at Etter's Pass, and this last time at Two Rivers when you damaged the knee again, you did a good deal of moving around on it when ordinarily such movement should have been unendurable."

His eyes narrowed a little, thoughtfully.

"Tell me—do you deny the pain . . . I mean do you refuse to admit the pain is there? Or do you *ignore* it—that is you remain conscious the sensation is there but you don't allow the sensation to affect you?"

"I ignore it," answered Cletus. "I start out by relaxing to the point where I feel a little bit as if I'm floating. Just that much relaxation takes a lot of the sting out of the pain right there. Then I move in on what's left and more or less take the color out of it. What I'm left with is a little like a feeling of pressure. I can tell if it increases or decreases, or if it goes away entirely, but I'm not bothered by it in any way."

Mondar nodded slowly.

"Very good. In fact, unusually good for self-trained," he said. "Tell me, can you control your dreams?"

"To a certain extent," said Cletus. "I can set up a mental problem before falling asleep, and work it out while I'm asleep—sometimes in the shape of a dream. I can also work out problems the same way while I'm awake, by throwing a certain section of my mind out of gear, so to speak, and letting the rest of my body and mind run on automatic pilot."

Mondar gazed at him. Then, he shook his head. But it was an admiring shake.

"You amaze me, Cletus," the Exotic said. "Would you try something for me? Look at that wall just to your left there, and tell me what you see."

Cletus turned his head away from Mondar and gazed at the flat, vertical expanse of white-painted wall. There was a small prickling sensation at the side of his neck, just behind and below his right ear—followed by a sudden explosion of pain from the site of the prick, like the pain from the venom of a bee sting following the initial

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puncture. Cletus breathed out calmly, and, as the breath left his lungs, a crimson violence of the pain was washed clean and unimportant. He turned back to Mondar.

"I didn't see anything," he said, "of course."

"Of course. It was only a trick to get you to turn your head away," said Mondar, putting what looked like a miniature mechanical pencil back in his robes. "The amazing thing is, I wasn't able to measure any skin-flinch; and that's a physiological reaction. Clearly your body hasn't much doubt about your ability to handle pain quickly."

He hesitated.

"All right, Cletus," he said. "I'll work with you. But it's only fair to warn you I still don't see any real chance of success. How soon do you want the transplant done?"

"I don't want it done," said Cletus. "I think you're probably quite right about the impossibility of suppressing my rejection mechanism. So we'll do something else. As long as it's a long shot anyway, let's try for a miracle cure."

"Miracle . . ." Mondar echoed the word slowly.

"Why not?" said Cletus cheerfully. "Miracle cures have been reported down through the ages. Suppose I undergo a purely symbolic operation. Flesh and bone are missing from my left knee where the prosthetic unit was surgically implanted after I was first wounded years ago. I want that surgical implant taken out and some small, purely token portions, of the flesh, and bone from the equivalent areas of my right knee transplanted into the area where the original flesh and bone are missing in the left. Then we cover both knees up with a cast—" his eyes met Mondar's— "and you and I concentrate hard while healing takes place."

Mondar sat for a second. Then he stood up.

"Anything is eventually possible," he murmured. "I've already said I'd help you. But this is something that's going to require some thought, and some consultation with my fellow-Exotics. I'll come back to see you in a day or two."

On that note, he left.

The next morning Cletus had a visit from both Eachan Khan and Melissa. Eachan came in first, alone. He sat stiffly in the chair beside Cletus's bed. Cletus, propped up in a sitting position himself, gazed at the older man keenly.

"Understand they're going to try to do something to fix that knee of yours," Eachan said.

"I twisted some arms," answered Cletus, smiling.

"Yes. Well, good luck." Eachan looked out the window of the room for a moment and then back at Cletus. "Thought I'd bring you the good wishes of our men and officers," he said. "You promised them a victory almost without a casu-

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alty—and then you delivered it."

"I promised a battle," Cletus corrected, gently. "And I was hoping we wouldn't have much in the way of casualties. Besides they deserve a good deal of credit themselves for the way they executed their battle orders."

"Nonsense!" said Eachan brusquely. He cleared his throat. "They all know you're emigrating to the Dorsai. All are very happy about it. Incidentally, seems you started a small rash of emigrations. That young lieutenant of yours is coming over as soon as his shoulder heals up."

"You accepted him, didn't you?"

"Oh, of course," Eachan said. "The Dorsai'll accept any military man with a good record. He'll have to pass through our officers school, of course, if he wants to keep his commission with us, though. Marc Dodds told him there was no guarantee he'd make it."

"He will," said Cletus. "Incidentally, I'd like your opinion on something—now that I'm a Dorsai myself. If I supply the funds for subsistence, training facilities and equipment, do you suppose you could get together a regiment-size body of officers and men who would be willing to invest six months in a complete retraining program? I could guarantee them that, at the end of that time, they'd be able to find employment at half again their present pay?"

Eachan stared.

"Six months! A long time for a professional soldier to live on subsistence," he said, after a moment. "But after Two Rivers, I think it just might be done. It's not just the hope of better pay, much as that means to a lot of these people who've got families back on the Dorsai. It's the better chance of staying alive to get back to the families, that you might be able to give them. Want me to see about it?"

"I certainly would appreciate it," said Cletus.

"All right," said Eachan. "But where's the money to come from for all this?"

Cletus smiled.

"I've got some people in mind," he said. "I'll let you know about that later. You can tell the officers and the men you contact that it's all conditional on my having the funds, of course."

"Of course," Eachan fingered his moustache. "Melly's outside."

"Is she?" asked Cletus.

"Yes. I asked her to wait while I had a word with you on some private matters first, before she came in . . ." Eachan hesitated. Cletus waited.

Eachan's back was as stiffly upright as a surveyor's rod. His jaw was clamped and the skin of his face was like stamped metal.

"Why don't you marry her?" he said, gruffly.

"Eachan—" Cletus checked himself and paused. "What makes you

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think Melissa would want to marry me?"

"She likes you," said Eachan. "You like her. You'd make a good team. She's mostly heart and you're nearly all head. I know you both better than you know each other."

Cletus shook his head slowly, for once finding no words.

"Oh, I know she acts as if she knows all the answers when she doesn't, and acts like she wants to run my life, and yours, and everybody else's for them," went on Eachan, "but she can't help it. She does feel for people, you know—I mean, feel for what they're actually like, at core. Like her mother in that. And she's young. She feels something's so about someone and can't see why they don't do exactly what she thinks they ought to do, being who they really are. But she'll learn."

"And me?" Cletus said. "What makes you think I'd learn?"

"Try it. Find out," retorted Eachan.

"And what if I made a mess of it?" Cletus looked up at him with more than a touch of grimness.

"Then at least you'll have saved her from deCastries," said Eachan, bluntly. "She'll go to him to make me follow her—to Earth. I will, too, to pick up the pieces. Because that's all that'll be left of her afterwards—pieces. With some women it wouldn't matter, but I know my Melly. Do you want deCastries to have her?"

"No," said Cletus, suddenly quiet. "And he won't. I can promise you that, anyway."

"Maybe," said Eachan, getting to his feet.

He swung about on his heel.

"I'll send her in now," he said; and went out.

A moment or two later, Melissa appeared in the doorway. She smiled wholeheartedly at Cletus and came in to seat herself in the same chair Eachan had just vacated by the bed.

"They're going to fix your knee," she said. "I'm glad."

He watched her smile. And for a second there was an actual physical sensation in his chest, as if his heart had actually moved at the sight of her. For a second what Eachan had said trembled in his ears and the guarded distance that life and people had taught him to keep about him, threatened to dissolve.

"I was talking to Arvid today . . ." her voice ran down. He saw her blue eyes locked with his, as if hypnotized; and became aware that he had captured her with his own relentless stare.

"Melissa," he said slowly, "what would you say if I asked you to marry me?"

"Please . . ." it was barely a whisper. He shifted his gaze, releasing her, and she turned her head away.

"You know I've got Dad to think about, Cletus," she said.

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"Yes, Melissa," he said. "I know."

She looked back, suddenly, flashing her smile at him and put a hand on one of his hands, where it lay on the top sheet of the bed. "But I wanted to talk to you about all sorts of other things," she said. "You really are a remarkable man, you know."

"I am, am I?" he said; and summoned up a smile, himself.

"You know you are," she said, sobering. "You've done everything just the way you said you would. You've won the war for Bakhalla, and did it all in just a few weeks with no one's help but the Dorsai troops. And now you're going to be a Dorsai yourself. There's nothing to stop you from writing your books, now. It's all over."

Pain touched his inner self—and the guarded distance closed back around him. He was once more alone among people who did not understand.

"I'm afraid not," he said. "It's not over. Only the first act's finished. Actually, now it really begins."

She stared at him.

"Begins?" she echoed. "But Dow's going back to Earth tonight. He won't be coming out here again."

"I'm afraid he will," said Cletus.

"He will? Why should he?"

"Because he's an ambitious man," said Cletus, "and because I'm going to show him how to further that ambition."

"Ambition!" her voice rang with disbelief. "He's already one of the five Prime Secretaries of the Coalition Supreme Council. It's only a year or two, inevitably, until he's got a seat on the Council itself! What else could he want? Look at what he's got already!"

"You don't quench ambition by feeding it, any more than you quench a fire the same way," said Cletus. "To an ambitious man what he already has is nothing. It's what he doesn't have that counts."

"But what doesn't he have?" she was genuinely perplexed.

"Everything," said Cletus. "A united Earth, under him, controlling all the Outworlds, again under him."

She stared at him.

"The Alliance and the Coalition combine?" she said. "But that's impossible. No one knows that better than Dow."

"I'm planning to prove to him it is possible," said Cletus.

A little flush of anger colored her cheeks.

"You're planning—" she broke off. "You must think I'm some kind of a fool, to sit and listen to this!"

"No," he said, a little sadly, "no more than anyone else. I'd just hoped that for once you'd take me on faith."

"Take you on faith!" Suddenly, almost to her own surprise, she was blindingly furious. "I was right when I first met you and I said

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you're just like Dad. Everybody thinks he's all leather and guns and nothing else; and the truth of the matter is those things don't matter to him at all. Nearly everybody thinks you're all cold metal and calculation and no nerves. Well, let me tell you something—you don't fool everybody. You don't fool Dad, and you don't fool Arvid. Most of all, you don't fool me! It's people you care about, just like it's tradition Dad cares about—the tradition of honor and courage and truth and all those things nobody thinks we have any more. That's what they took away from him, back on Earth, and that's what I'm going to get back for him, when I get him back there—if I have to do it by main force. He's just like you, he has to be made to take care of himself and get what he really wants."

"Did you ever stop to think," said Cletus, quietly, when she finished, "that perhaps he's found tradition all over again on the Dorsai?"

"Tradition? The Dorsai?" Scorn put a jagged edge on her voice. "A world full of a collection of ex-soldiers gambling their lives in other people's little wars for hardly more pay than a tool programmer gets! You can find tradition in that?"

"Tradition to come," said Cletus. "I think Eachan sees into the future farther than you do, Melissa."

"What do I care about the future!" She was on her feet now, looking down at him where he lay in the bed. "I want him happy. He can take care of anyone but himself. *I* have to take care of him. When I was a little girl, right before she died, my mother asked me . . . *me* . . . to be sure and take care of him. And I will!"

She whirled about and went toward the door.

"And he's all I'm going to take care of!" she cried, stopping and turning again at the door. "If you think I'm going to take care of you, too, you've got another think coming! So go ahead, gamble yourself twice over on some high principle or another, when you could be settling down and doing some real good, writing and working person to person, the way you're built to do!"

She went out. The door was too well engineered to slam behind her; but that was all that saved it from slamming.

Cletus lay back against his pillows and gazed at the empty, white, and unresponsive wall, opposite. About him, the hopsital room felt emptier than it had ever felt before.

He had still one more visitor, however, before the day was out. This was Dow deCastries, preceded into Cletus's hospital room by Wefer Linet.

"Look who I've got with me, Cletus!" said Wefer, cheerfully. "I ran into the Secretary here at the Officers Club where he was having

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lunch with some of the Exotics, and he told me to bring you his congratulations for abstract military excellence—as opposed to anything affecting the Neuland-Bakhalla situation. I asked him why he didn't come along and give you the congratulations, himself. And here he is!"

He stepped aside and back, letting Dow come forward. Behind the taller man's back Wefer winked broadly at Cletus.

"Got to run an errand here in the hospital, myself," said Wefer. "Back in a minute."

He ducked out of the room, closing the door behind him. Dow looked at Cletus.

"Did you have to use Wefer as an excuse?" Cletus asked.

"He was convenient," Dow shrugged, dismissing the matter. "My congratulations, of course."

"Of course," said Cletus. "Thank you. Sit down, why don't you?"

"I prefer standing," said Dow. "They tell me you're going off to bury yourself on the Dorsai, now. You'll be getting down to the writing of your books, then?"

"Not just yet," said Cletus.

Dow raised his eyebrows.

"There's something else for you to do?"

"There's half a dozen worlds and a few billion people to be freed, first," said Cletus.

"Free them?" Dow smiled. "From the Coalition?"

"From Earth."

Dow shook his head. His smile became ironic.

"I wish you luck," he said. "All this, in order to write a few volumes?"

Cletus said nothing. He sat, as if waiting. Dow's smile went away.

"You're quite right," Dow said, in a different tone, though Cletus still had not spoken, "time is growing short; and I'm headed back to Earth this afternoon. Perhaps I'll see you there—say in six months?"

"I'm afraid not," said Cletus. "But I expect I'll see you out here—among the New Worlds. Say, inside two years?"

Dow's black eyes grew cold.

"You badly misunderstand me, Cletus," he said. "I was never built to be a follower."

"Neither was I," said Cletus.

"Yes," said Dow, slowly. "I see. We probably will meet after all then—" his smile returned, suddenly and thickly, "at Phillippi."

"There never was any other place we could meet," said Cletus.

"I believe you're right. Fair enough," said Dow. He stepped backwards and opened the door. "I'll wish you a good recovery with that leg of yours."

"And you, a safe trip to Earth," said Cletus.

Dow turned and went out. Several minutes later the door opened again and Wefer's head appeared in the opening.

"DeCastries gone?" Wefer asked. "He didn't talk long at all, then?"

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"We said what we had to say," answered Cletus. "There wasn't much point in his staying, once we'd done that."

XVII

Three days later, Mondar visited Cletus.

"Well, Cletus," he said, sitting down in the chair by the bed, "I've spent most of my time since I saw you last going into your situation with other members of our group who've had more experience with certain aspects of what you suggested, than I have. Altogether we worked out a pattern of behavior that looks as if it might give the greatest possible encouragement to the miracle you're after. The main question seemed to be whether it would be better for you to be intimately acquainted with the physiology of your knees, and the process of tissue growth and regrowth; or whether it would be better for you to have as little knowledge of it as possible."

"What was the decision?" Cletus asked.

"We decided it would be best if you knew as little as possible," Mondar said. "The point is, the stimulus for what's going to be essentially an abnormal body reaction has to come from a very primitive level of the organism. You being the organism."

"You don't want me visualizing what's going on, then?"

"Just the opposite," answered Mondar. "You should remove your concern with the regrowth process as completely as possible from any symbolic area. Your determination to achieve regrowth must be channeled downward into the instinctive level. To achieve that channeling you're going to need practice; and so we worked up a set of exercises which I'm going to teach you to do over the next two weeks. I'll come here and work with you daily until you can do the exercises by yourself. I'll observe until I think you've got complete control in the necessary areas. Then we'll recommend the symbolic operation, in which the genetic pattern of your right knee will be transferred in the form of a few cells of tissue of flesh and bone to the area of the left knee where we want regrowth to take place."

"Good," said Cletus. "When do you want to start the exercises?"

"Right now, if you like," answered Mondar. "We start out by getting off the topic of your knees entirely and into some completely different area. Any suggestions for a topic?"

"The best one in the universe," Cletus answered. "I was intending to talk to you about it anyway. I'd like to borrow two million IMUs."

Mondar gazed at him for a second, then smiled.

"I'm afraid I don't have that much with me," he said. "After all out here away from Earth two mil-

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lion International Monetary Units are rather scarcer than they are back on Earth. Are you very urgent about your need for them?"

"Urgent and absolutely serious," replied Cletus. "I'd like you to talk to your fellow Exotics here in Bakhalla—and anywhere else, if necessary. I'm not wrong, am I, in thinking your organization could lend me that kind of money if you thought it was worthwhile?"

"Not wrong, no . . ." said Mondar, slowly. "But you have to admit it's a rather unusual request from an essentially propertyless ex-colonel in the Alliance Forces who's now an emigrant to the Dorsai. What do you plan doing with a sum of money like that?"

"Build an entirely new type of military unit," Cletus answered. "New in organization, training, hardware and tactical abilites."

"Using," said Mondar, "the Dorsai mercenaries, of course?"

"That's right," answered Cletus. "I'm going to produce a fighting force at least five times as effective as any comparable military unit presently in existence. Such a force will be able to underbid not only the Alliance, but the Coalition, when it comes to supplying military force to an off-Earth colony such as yours, here. I can raise the pay of the men and officers in it and still market an effective force for less than even the Dorsai mercenaries were charging in the past—simply because we'll need less men."

"And you're suggesting," Mondar said, thoughtfully, "that such a mercenary force would soon pay back a two million loan?"

"I don't think there's any doubt of it," said Cletus.

"Possibly not," said Mondar, "provided these new mercenaries of yours will do what you say they'll do. But how could anyone know that in advance? I'm afraid, Cletus, that our organization would need some kind of security before lending such a large amount of credit."

"Security," said Cletus, "is often unnecessary where the borrower's reputation is good."

"Don't tell me you've borrowed two million IMUs on occasions before this?" Mondar raised his eyebrows quizzically.

"I was speaking of a military, not a financial, reputation," Cletus said calmly. "Your Exotics have just had the best possible proof of the military reputation in question. A small group of Dorsai mercenaries, single-handed, have succeeded in doing what a very large and much better equipped Alliance force wasn't able to do—essentially destroy Neuland as a military power and win the local war for your colony. The conclusion to be drawn from that is that this colony of yours doesn't need the Alliance forces. It can protect itself adequately with its Dorsai mercenaries, alone. Am I right?"

"You certainly present a good argument," said Mondar.

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"The security for the loan, therefore," said Cletus, "is the best sort of security in the world. It's the literal security of this colony, guaranteed by the Dorsai mercenaries until the loan is paid back."

"But what if . . . ah . . . you Dorsais should default on your bargain? I don't mean to insult you, of course, but in matters like this all possibilities have to be considered. If I don't bring up the question, someone else will. What if, after we'd lent you the money and you'd retrained your troops, you refused either to pay or to continue guaranteeing the security of this colony?"

"In that case," said Cletus, spreading his hands on the sheet of the bed frankly, "who else would hire us? Successful mercenaries, like traders in any other goods, build their business on the basis of satisfied customers. If we took your money and then welshed on our agreement, what other colony would be willing to take a chance on us?"

Mondar nodded.

"A very good point," he said. He sat for a moment, his gaze abstracted, as if he communed with himself in some secret corner of his brain. Then his eyes came back to Cletus.

"Very well," he said, "I'll convey your request for a loan to my fellow Exotics. That's as much as I can do, you realize. It'll take some little time for the matter to be considered; and I can't promise you any great hopes of success. As I said, it's a very large amount of credit you're asking to borrow, and there is, after all, no great reason why we should lend it."

"Oh, I think there is," said Cletus easily. "If my estimate of you Exotics is correct, one of your eventual aims is to be completely independent of outside obligations—so that you can be free to work out your vision of the future without interference. The Alliance's military aid has been helpful to you, but it's also kept you under the Alliance's thumb. If you can buy security from mercenary soldiers without obligation, you'll have achieved a freedom that I think you all want very badly. A two million unit loan on good security is a small risk to take for the chance of gaining that freedom."

He looked significantly at Mondar. Mondar shook his head slightly with a touch of admiration in his face.

"Cletus, Cletus," said Mondar, "what a waste it is, your not being an Exotic!" He sighed, and sat back in the chair. "Well, I'll pass your request for a loan along. And now, I think it's time we got started with your exercises. Sit back and try to achieve that state of a floating sensation you described to me. As you probably know, it's called a state of regression. I'm also putting myself now into such a state. When you're ready, join me in concentra-

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tion on that isolated pinpoint of life, that single sperm cell that was the first core and beginning of your consciousness. To that early and primitive consciousness, now, you must try to return . . ."

Three weeks later, healing well and with both legs stiffened by a walking cast about each knee, Cletus was swinging along on wrist-crutches with Arvid in the Bakhalla in-town terminal. They were headed toward the airbus which would lift them to that same shuttleboat landing pad on which Cletus had first set down on Kultis, a couple of months before—the airbus being made necessary by new construction on the road to the pad, now that guerrilla activity had been halted.

As they passed the main lounge of the terminal, an Alliance officer stepped out in front of them. He was First Lieutenant Bill Athyer, and he was drunk—not drunk enough to stumble in his speech or his walk, but drunk enough to bar their way with an ugly light in his eye. Cletus halted. Arvid took half a step forward, opening his mouth, but Cletus stilled the big young man with a hand on one massive arm.

"Leaving for the Dorsai, are you, Colonel?" said Athyer, ignoring Arvid. "Now that everything's nice and prettied up here, you're on your way?"

Cletus leaned on the crutches. Even bent over in this position, he had to look down to meet Athyer's bloodshot eyes.

"Thought so." Athyer laughed. "Well, sir—I didn't want to let you get away, sir, without thanking you. I might have gone up before a review board, if it hadn't been for you, sir. Thank you, sir."

"That's all right, Lieutenant," said Cletus.

"Yes, isn't it? Quite all right," said Athyer. "And I'm safely tucked away in a library instead of facing a reprimand and maybe losing one turn at an advance in grade. No danger of my getting out in the field where I might foul up again—or, who knows, might even make up for not being quite as smart as you up at Etter's Pass, sir."

"Lieutenant—" Arvid began in a dangerous rumble.

"No," said Cletus, still leaning on the crutches, "let him talk."

"Thank you, Colonel. Thank you, sir," Athyer's voice broke suddenly, raw-throated: "Damn you, Colonel, did your precious reputation mean so much to you, you had to bury me alive? At least you could've let me take my lumps fair and square, without any show-off kindness from you! Don't you know I'll never get another chance in the field, now? Don't you know you've marked me for good? What am I supposed to do now, stuck in a library for the rest of my army life with nothing but books?"

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"Try reading them!" Cletus made no attempt to hold his voice down, now. It carried clearly to the crowd that by now was listening; and the scorn in it was, for once in his life, cruel and unsparing. "That way, you just might learn something about the handling of troops in combat. Come along, Arv."

He swung his crutches out to one side and went on around Athyer. Arvid followed. Behind them, as the crowd closed in about them once more, they heard Athyer's hoarse, pursuing shout.

"I'll read, all right!" it rang behind them. "And I'll keep reading until I've got the goods on you—*Colonel!*"

XVIII

Six months later, Cletus was not only successfully healed, but ready to begin upon the work he had anticipated, in emigrating to the Dorsai.

Entering the last two miles of his fifteen-mile daily run, he leaned into the beginning of the long slope up the hill that would bring him back to the shore of Lake Athan across from the home of Eachan Khan on the outskirts of the town of Foralie, on that world known as the Dorsai. His stride shortened, his breathing deepened; but aside from these changes there was no difference. He did not slacken speed.

It had been nearly five months now since the casts had been taken off both his legs to reveal a perfectly healthy, regrown left knee. The local medical fraternity had been eager to keep him available for tests and study of the essential miracle that had occurred. But Cletus had other fish to fry. Within a week, tottering along on legs that had just begun to relearn how to walk, he took ship with Melissa and Eachan Khan for the Dorsai. He had been here since, his engagement to Melissa an accepted fact, as a guest in Eachan's household; and the time from his arrival until now had been spent in unrelenting physical self-training.

The methods of that training were simple, and except in one respect, orthodox. Basically, he spent his days in walking, running, swimming and climbing. It was the climbing that provided the one unorthodox element to this routine; for Cletus had caused to be built, and continually added to since its first construction—a sort of adult-sized jungle gym. A maze of steel pipes interconnected at different heights and angles, that was now some thirty feet high, twenty feet wide and more than fifty feet long.

Cletus's day began—six months after his departure from the hospital on Kultis—with a vertical climb, hands only and without pause, from the ground to the top of a rope suspended from a tree limb eighty feet above ground. Having reached the limb, he then moved a dozen feet farther out

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along its length, climbed down a shorter rope only fifty in length and set it swinging until the arc of his airborne travels brought him close enough to the top bar of the jungle gym for him to catch hold. The next thirty minutes or so were spent in clambering through the jungle gym, by routes that had grown increasingly complex and tortuous as the gym had been extended and Cletus's physical condition had improved.

At the far end of the jungle gym, his morning's run—which was now fifteen miles—began. It was a run that began across country on fairly level surface, but later wandered among a variety of the steep hills and slopes which this mountainous territory provided. Here, the altitude was eighty-four hundred feet above sea level, and the effect upon Cletus's red blood cell count and coronary artery size had been remarkable.

It ended with this long, steady uphill slope two miles in length. Just beyond the upper end of the slope, the ground dipped down again for about fifty yards among pinelike trees, and Cletus came to the edge of Lake Athan.

He did not even break stride as he approached the bank; but went off it in a shallow dive directly into the waters of the lake. He surfaced and began swimming the half mile distance across the lake to the shore above which the long, low-roofed, rather rustic shape of Eachan's house could be seen, small among trees.

The water of this mountain lake was cold, but Cletus was not chilled by it. His body, heated by the run, found it pleasantly cool. He swam as he had done all the rest of his exercise, dressed in running shoes, sox, shorts and shirt; and he was by now so accustomed to the weight of these water-heavy shoes and clothes upon him, that he did not notice them.

He swam powerfully, arms digging deep, his head rolling rhythmically toward his right shoulder to take deep breaths of the upland air. His feet churned a steady wake behind him. Almost before he had settled to the soothing rhythm of his swimming, he drove into the shallow water at the lake's other side and got to his feet.

He glanced at his wristwatch and trotted leisurely up the slope to the ground-floor sliding window that led him directly into his own bedroom. Ten minutes later, showered and changed, he joined Eachan and Melissa in the sunny dining room of the long house for lunch.

"How did you do?" asked Melissa.

She smiled at him, with a sudden, spontaneous warmth; and a warm current of shared feeling sprang into existence between them. Six months of close association had destroyed all obvious barriers separating them. Cletus, as a person, was too likable, and Me-

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lissa too outgoing, for them not to be drawn together like two magnets under such close conditions. They had reached the stage now where what they did not say to each other was almost more important than their words.

"Under six minutes average on the fifteen mile run," he answered her now. "A little over ten minutes crossing the lake." He looked over at Eachan. "I think it's time to set up that demonstration I planned. We can use the running track in the stadium at Foralie."

"I'll attend to it," said Eachan.

Three days later the demonstration took place. Present in the Foralie stadium under a warm August sun were the eighty-odd ranking Dorsai officers Eachan had invited. They sat down front in one section of the stand before a large screen fed by a battery of physiological monitoring equipment tuned to various transmitters on and within Cletus's body.

Cletus was in his regular running outfit. Neither the jungle gym nor a pool for swimming was in evidence, since this was to be a simple demonstration of endurance alone. As soon as the visiting officers were all seated, Eachan stood by to monitor the reports of various instruments onto the screen so that all could see them, and Cletus started running.

The various mercenary officers present had all been made acquainted with Cletus's history, particularly the events on Kultis, and the near-miraculous regrowth of his once-wounded knee. They watched with interest while Cletus set a pace of nearly ten miles an hour around the half mile track. After the first mile, he dropped back to a little better than eight miles an hour. His pulse, which had peaked at a hundred and seventy, dropped to about a hundred and forty and hung there.

He was running quite easily and breathing steadily as he approached the four-mile mark. But then, although his speed did not decrease, his pulse began to climb once more slowly until by the end of the six miles it was almost up to a hundred and eighty. Here it peaked again, and from that point on he began slowly to lose speed. By the time he had completed the eighth mile he was down below seven miles an hour, and by the time he finished the ninth he was barely moving at six miles an hour.

Clearly, he was approaching the exhaustion point. He pushed himself twice more around the track. Coming up toward the end of the tenth mile, he was barely jogging. Clearly, he had run himself out, but this kind of performance by anyone, let alone a man who had been a prosthetic cripple half a standard year before, was enough to waken a hum of amazement and admiration from the watchers.

Some of them stood up in their

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seats, ready to step down into the field and congratulate Cletus, as he tottered toward the conclusion of the tenth mile, which seemed obviously intended to be the end of the race.

"Just a minute, please, gentlemen," Eachan Khan said. "If you'll hold your seats a little longer—"

He turned and nodded to Cletus, who was now passing the ten-mile mark directly in front of the viewers. Cletus nodded, and kept on going.

Then, to the utter astonishment of the watchers, a remarkable thing happened. As Cletus continued on around the track, his step became firmer, and his breathing eased. He did not immediately pick up speed, but his pulse rate, as shown on the viewing screen, began slowly to fall.

At first it went down by ragged steps, dropping a few beats, holding firm, then dropping a few more. But as he continued, it began to drop more steadily. By the time he was back around in front of the watching officers, his pulse rate was back at a hundred and fifty.

And his speed began to pick up.

It did not pick up much. He gained back to just under six miles an hour; but he held steady at that pace, continuing to circle the track.

He ran six more laps of the track—three miles—and at the end of the third mile, his speed and pulse rate were still constant.

At the end of that additional third mile he stopped running, walked a lap without any sign of unusual distress, and ended up back in front of the watching group, breathing normally and hardly perspiring, with his pulse in the low seventies.

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"That's it, gentlemen," he said, addressing them. "Now I'm going to have to take a few minutes to clean up. You can adjourn to Eachan's house, where we'll be able to talk in more comfort and privacy. I'll join you there in about twenty minutes. I'll leave you now to consider what you've just seen without any further explanation than what you've just seen me do did, in fact, exact a penalty upon my bodily reserves greater than that ordinarily demanded by exertion. However, as you see, it was possible and practical, at that price."

He turned away toward the dressing room at the near end of the stadium. The spectators moved outside to an airbus rented by Eachan, and were flown out to Eachan's house, where the window wall all along one side of the long

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living room had been opened up so that the living room and the patio outside became one large gathering space. Food and drink had been provided. There, a little later, Cletus joined them and spoke to them.

"As you know," he said, standing facing them as they sat in a rough semicircle in chairs about him, "all of you here were officers we invited because I hoped you might be interested in joining me in forming an entirely new type of military unit. It is a military unit I intend to command, and it will pay its officers and men only subsistance during a training period of some months. Thereafter it will pay them at least double the rate they had been receiving as mercenaries up until this time. It goes without saying that I want the cream of the crop; that I expect that cream of the crop to invest not merely their time, but their wholehearted enthusiasm in this new type of organization I have in mind."

He paused.

"That was one of the reasons for the demonstration you've just seen," he said. "What you saw, in the crudest terms, was a demonstration in which I was at least half again as physically effective as my bodily energy level and conditioning should have allowed me to have been. In short, I've just given you an example of how a man can make himself into a man and a half—"

He paused again; and this time he raked his eyes over every face in the audience before he continued.

"I am going to expect," he said, slowly and emphatically, "every enlisted man and officer in this military unit I'm forming to be able to multiply himself to at least that extent, by the time he's finished training. This is a first prerequisite, gentlemen, for anyone wishing to join me in this venture."

He smiled, unexpectedly.

"Now relax and enjoy yourselves. Stroll around the place, look at my homemade training equipment, and ask as many questions as you like of Eachan, Melissa Khan, or myself. We'll have another meeting out here in a few days for those of you who have decided to join."

He stepped away from the center of their attention and made his way to the buffet tables where the food and drink had been set up. Behind him, the gathering broke up into small groups and the hum of voices arose. By late afternoon most of the visitors had left, some twenty-six of them having pledged their services to Cletus before leaving. A somewhat larger number had promised to think it over and get in touch with him within the next two days. There remained a small group of those who had already pledged themselves to Cletus before the demonstration. These met in the once more enclosed living room after dinner for a private conference.

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Present were Arvid, now recovered from his shoulder wound, Major Swahili and Major David ap Morgan, whose family was also a Foralie neighbor of Eachan's. Eachan's other officers were still back in Bakhalla, commanding the force of Dorsais that remained there in Exotic pay to guard the colony, now that the Alliance had withdrawn its troops under Bat Traynor. Bat's misgivings about leaving had not been shared by Alliance HQ, back on Earth, which had been overjoyed to free nearly half a division of men to reinforce its hard-pressed military commitments on half a dozen other new worlds. In addition to Arvid, ap Morgan, Swahili and Eachan himself, were two old friends of Eachan's—a Colonel Lederle Dark and a Brigadier General Tosca Aras. Dark was a thin, bald man who seemed to be all bone and long muscle under a somewhat dandified exterior. Tosca Aras was a small, neat, clean-shaven man with washed-out blue eyes and a gaze as steady as an aimed field rifle in its gun mount.

"By the end of the week," Cletus said to them all, "anyone who hasn't made up his mind to join us won't be worth having. From those I talked to today, I estimate we'll get perhaps fifty good officers, perhaps ten of which we'll lose in training. So there's no point in wasting time. We can start setting up a table of organization and a training schedule. We'll train the officers, and they can train their men, afterwards."

"Who's to be in charge of the extra-energy training?" asked Lederle Dark.

"I'll have to be, to begin with," Cletus answered him. "Right now, there's nobody else. And all of you will have to join the other officers in my classes on that. The rest of it can be handled by all of you—it's simply a matter of running them through the physical, and practicing standard field problems but from the viewpoint of the new organizational setup."

"Sir," said Arvid, "excuse me, but I still don't seem to really understand why we need to shake up the whole table of organization. Unless you want it different just so the men in this outfit will feel that much more different."

"No—though the feeling of difference isn't going to do us any harm," Cletus said. "I should have gone into this with all of you before now. The plain fact of the matter is that a military body structured into squads, platoons, companies, battalions and so on is designed to fight the type of war which used to be common but which we aren't going to be encountering out here on the new worlds. Our fighting units are going to bear more resemblance to a group of athletes in a team sport, than they are to the old type of fighting unit. The tactics they're going to be using—my tactics—

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aren't designed for structured armies in solid confrontation with each other. Instead, they're designed to be useful to what seems to be a loose group of almost independently-acting units, the efforts of which are coordinated not so much by a hierarchy of command as by the fact that like good members of a team they're familiar with each other and can anticipate what their teammates will do in response to their own actions and the general situation."

Cletus paused and looked around him. "Do you understand that, now?" he asked.

Eachan cleared his throat.

"We understand what you say, Cletus," he said. "But what the words are going to mean when they're turned into battle units is something we've got to see before it'll make much sense. Here you cut the squad to six men—and that's divided into two teams of three men each. You make four squads to a group, with a senior or junior groupman in charge; and two groups make up a force. It's plain enough, but how's anyone going to know how it'll work until they see it in practice?"

"They aren't. You aren't—of course," answered Cletus. "But what you can do now, is absorb the theory of it, and the reasoning behind the theory. Shall I go over it again?"

There was a moment of silence.

"Probably better," said Eachan.

"All right then," said Cletus. "As I think I've told you, the basic principle is that from the individual right up to the largest organizations within the total Dorsai military command, each unit should be capable of reacting like a single member of a team made up of other members equal in size and importance to himself. That is, any one of the three soldiers in any given half squad should be able to operate in perfect unison with the other two members of his team with no more communication than a few code words, or signals, which would cue the others to standard actions or responses to any given situation. Similarly the two teams in any squad should be able to work as partners with no more than a few code words, or signals. Likewise the four squads should be able to operate as a team in the group with each squad knowing its role in any one of a hundred or more group actions identifiable by code word or signal. Just so the two groups must be able to react together almost instinctively as a single command, the commandant of which should likewise be trained to react in pattern with the commandants of the commands with which he is associated."

Cletus stopped talking. Once more there was silence.

"You say you'll supply the patterns?" Tosca Aras said. "I mean you'll work out all these team-ac-

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tions that are triggered off by code words and signals and so forth?"

"I already have them worked out," said Cletus.

"You have?" Aras's voice teetered on the edge of incredulity. "There must be thousands of them."

Cletus shook his head.

"Something over twenty-three thousand, to be exact," he said. "But I think you may be missing the point. The actions of a team are included within the actions of the squad, just as the actions of the squad are included within the actions of the group. In short—it's like a language with twenty-three thousand words. There are innumerable combinations, but there's also a logical structure. Once you master the structure, then the choice of words within the sentence is severely restricted. In fact, there's only one ideal choice."

"Then why have such a complicated setup anyway?" asked David ap Morgan.

Cletus turned to look at the young major.

"The value of the system," he said, "doesn't come so much from the fact that there're a large number of combinations of tactical actions, ranging from the team on up through the command, but from the fact that any large choice of action implies a certain spectrum of choices of action for the lesser elements of the command. So that the individual soldier, on hearing the general code word for the command to which he belongs, knows immediately within what limits the actions of all the groups, all the squads, and his own team must be."

He paused.

"In short," he said, "no one, right up through the battle operator, or the commander of the total military unit, simply follows orders. Instead, they all—right down to the individual line soldier—react as a team member in a common effort. The result is that breaks in the chain of command, misunderstood or incorrect orders, and all the other things that mess up a battleplan by mischance, are bypassed. Not only that, but from the lowest ranks on up each subordinate is ready to step into the position of his superior with ninety percent of the necessary knowledge that his superior had at the moment the superior was put out of action."

Arvid gave a low whistle of admiration. The other officers in the room all looked at him. With the exception of Cletus, he was the only one among them who had never been a practicing Dorsai field officer. Arvid looked embarrassed.

"A revolutionary concept," said Tosca Aras. "More than revolutionary if it works out in practice."

"It's going to have to work," said Cletus. "My whole scheme of strategy and tactics is based on troops that can operate along those lines."

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"Well, we'll see." Aras picked up the thick manual Cletus had issued to each of them just after dinner and which had been lying since then in his lap. He stood up. "An old dog learning new tricks is an understatement, in my case. If the rest of you gentlemen don't mind, I'll be getting to my homework."

He said good night and went out, starting off a general exodus. Eachan stayed behind, and Arvid—Arvid, to apologize for that whistle.

"You see, sir," he said earnestly to Cletus, "it suddenly came clear to me, all of a sudden. I hadn't seen it before. But now I see how it all ties together."

"Good," said Cletus. "That's half the learning process done for you right there."

Arvid followed the others out of the living room. Eachan alone was left. Cletus looked at him.

"Do *you* see how it all hangs together?" Cletus asked him.

"Think so," said Eachan. "But remember I've been living with you for the last half year. And I know most of the patterns in that manual of yours, already."

He reached for the decanter behind the glasses on the small table beside his chair, and thoughtfully poured himself a small amount of whiskey.

"Shouldn't expect too much too soon," he said, sipping at it. "Any military man's bound to be a bit conservative. But they'll come through, Cletus. It's beginning to be more than just a name with us here, this business of being Dorsais."

He turned out to be correct. By the time the officers training program got under way a week later, all of those who had sat in the living room with Cletus that night knew their manuals by heart—if not yet quite by instinct. Cletus divided the officers to be trained among the six of them, in groups of roughly ten each; and training began.

Cletus himself took the class which he had labeled simply "Relaxation." That course would train these officers to tap that extra source of energy he had demonstrated to them at the Foralie stadium, after running himself to the normal exhaustion point. His first class consisted of the six from the living room. Eachan was among them, although he already had more than a faint grasp of the technique involved. Cletus had been privately tutoring both Eachan and Melissa in it for the past couple of months, and both had become noticeably capable with it. However, it was Eachan's suggestion—and Cletus found it a good one—that Eachan's inclusion in the class would be an example to the others that someone besides Cletus could achieve unusual physiological results.

Cletus took his class in hand just

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before lunch, after they had completed the full day's physical training schedule consisting of jungle gym, run and swim. They were physically unwound by the exercise, and more than a little empty because of the long hours since breakfast. In short, they were in a condition of maximum receptivity.

Cletus lined them up behind a long steel bar supported between two posts at about shoulder height off the ground.

"All right," he said to them. "Now I want you to stand on your right legs—you can reach out and touch the bar in front of you with your fingertips to help keep your balance then take your left foot off the ground and keep it off until I tell you to put it down again."

They complied. Their pose was a little on the ridiculous side; and there were a few smiles at first; but these faded as the legs on which they stood began to tire. About the time when bearing all their weight upon the muscle of one leg was beginning to become actively painful, Cletus ordered them to switch legs and kept them standing with all their weight on those left legs until the muscles of calf and thigh began to tremble under the full body weight. Then he switched them back to the right leg, and then again to the left, shortening the intervals each time as the leg muscles became exhausted more quickly. Very shortly they stood before him on legs as uncertain as those of men who had been bedridden for a period of weeks.

"All right, now," Cletus said then, cheerfully. "I want you up in a handstand, the palms of your hands on the ground, your arms fully extended. You can balance yourself this time by letting your legs rest against the bar."

They obeyed. Once they were up, Cletus gave them a further order.

"Now," he said, "one hand off the ground. Do your handstand on one arm only."

Upside down, he went through the same process he had when they had been right side up. Only, it took their arms only a fraction of the time it had taken their legs to tire. Very shortly he released them from their exercise; and they all tumbled to the ground, virtually incapacitated in all their limbs.

"On your backs," ordered Cletus. "Legs straight out, arms at your sides—but you don't have to lie at attention. Just straighten out on your back comfortably. Eyes on the sky."

They obeyed.

"Now," said Cletus, pacing slowly up and down before them, "I want you just to lie there and relax while I talk to you. Watch the sky—" It was one of those high, bright blue skies with a few clouds drifting lazily across it. "Concentrate on the feeling in your arms and legs, now that they've been relieved from the load of supporting

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your body against the force of gravity. Be conscious of the fact that it's the ground supporting you—and them: and be grateful for it. Feel how heavily and limp your arms and legs are, now that they've given up the work of bearing weight, and are themselves being borne by the surface of the ground. Tell yourself—not out loud—in your own words how limp and heavy they are. Keep telling yourself that and watching the sky.

"Feel how heavy and relaxed your body is, with its weight being supported by the ground beneath your back. Feel the relaxation in your neck, in the muscles of your jaw, in your face, even in your scalp. Tell yourself how relaxed and heavy all these parts of you are and keep watching the sky. I'll go right on talking, but pay no attention to me. Just give all your attention to what you're telling yourself and what you're feeling and how the sky looks . . ."

He continued to pace up and down talking. After a while, the arm and leg-weary men, soothed by their relaxed position and the slow movement of the clouds, lulled by the steady, pleasant, monotonous sound of his voice, ceased in fact to pay any attention to the sense of his words. He was merely talking.

To Arvid, at one end of the line, Cletus's voice seemed to have gone off and become as remote as everything else about him. Lying on his back, Arvid saw nothing but sky. It was as if the planet beneath him did not exist, except as a soft grassy pressure at his back, bearing him up. The clouds moved slowly in the endless blue, and he seemed to drift along with them . . .

A nudge at his feet brought him suddenly and sharply back to consciousness. Cletus was smiling down at him.

"All right," Cletus said, in the same steady low tone. "On your feet and step over there."

Arvid obeyed, getting heavily upright once more, and moving off as Cletus had indicated about a dozen feet. The rest were still on the ground with Cletus talking to them. Then he saw Cletus, who was still pacing, pause at the feet of David ap Morgan; and nudge the sole of David's right foot with his toe.

"All right, David," Cletus said, without breaking the pace or tone of his talking, "up you get and join Arvid over there."

David's eyes, which had closed, jerked open. He got to his feet and went over to stand by Arvid. As the two of them watched, one by one other members of the class went to sleep and were quietly wakened and weeded out until no one but Eachan still lay on the grass, his eyes wide open.

Cletus abruptly ended his talking with a chuckle.

"All right, Eachan," he said. "There's no point in my trying to

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put you to sleep. You get up and join the others."

Eachan rose. On their feet and all together once more the class looked at Cletus.

"The idea," said Cletus, with a smile, "is *not* to fall asleep. But we won't worry about that for a while yet. How many of you remember feeling any kind of a floating sensation before you did drop off?

Arvid and three others raised their hands. Eachan's was one of them.

"Well, that's it for today," Cletus said. "Tomorrow we'll try it without the muscle-tiring exercises first. But I want you to go back to your quarters and try doing this again, by yourself, at least three times before tomorrow morning. If you like, you can try putting yourself to sleep tonight with it. We'll gather together here again tomorrow, at this same place at the same time."

In the next few sessions Cletus worked with the class until all of them could achieve the floating sensation without drifting off into sleep. With this accomplished, then by easy stages into auto-control of pain and deep bodily sensations. When they had become fairly adept at this, he began to move them gradually from a relaxed and motionless position into movement—first getting them to achieve the floating sensation while standing upright, then when walking slowly and rhythmically forward, and finally under any kind of activity up to the most violent. This achieved, there only remained for them to apply the trance state in various types of auto-control under all conditions of activity. Finally he turned them loose to become teachers, in their turn to the other officers in training—who would, again, pass on the training eventually to the enlisted men under their command.

By this time nearly three months had gone by; and the officers in training had advanced to the point where they could begin to pass on at least the physical end of their training to the troops that would be under their orders. Recruitment was started for Dorsais to fill the enlisted ranks. And for some few extra Dorsai officers to replace those who had dropped out of the training program.

Just at this time Cletus received a thick envelope of clippings sent him by a news-clipping service on Earth he had contacted before leaving Bakhalla. He opened the envelope, alone in Eachan's study, and spread the clippings out in order of their dates to examine them.

The story they told was simple enough. The Coalition, sparked by a few key speeches by Dow deCastries himself, was attempting to raise a storm of protest against mercenary troops on the New Worlds in general, and the Dorsais in particular.

Cletus replaced the clippings in

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their envelope and filed them in the cabinet holding his own correspondence. He went out on the terrace to find Melissa.

It was high summer in these Dorsai mountains, and the sun was in late afternoon position above the further peaks. He paused for a moment, watching her as she sat reading unsuspecting that he watched. In the clear sunlight, her face was untroubled, and somehow more mature-looking than he remembered it, back at Bakhalla.

He went out on to the terrace and she looked up from her reading spool at the sound of his feet. He caught her gaze with his own; and her eyes widened a little at the seriousness with which he stood looking down at her. After a minute, he spoke.

"Will you marry me, Melissa?" he said.

The blueness of her eyes was as deep as the universe itself. Once again, as they had in the hospital in Bakhalla, her gaze seemed to evaporate the barrier of protective loneliness that his experience with life and people had led him to build about him. She looked up at him for a long moment before answering.

"If you really want me, Cletus," she said.

"I do," he replied.

And he did not lie. But, as the protective barrier flowed once more into position about his inner self, even as he continued to match her gaze with his, a cold interior part of his mind reminded him of the necessity that there would be now to lie, hereafter.

XIX

The wedding was set for a date two weeks away. Meanwhile, Cletus, seeing the formation of the force he had begun to raise on the Dorsai now beginning to operate under its own momentum, took time out for a trip back to Kultis and Bakhalla, for a conversation with Mondar; and a farther trip to Newton seeking employment for the newly-trained Dorsais of his command.

On Bakhalla, he and Mondar had an excellent dinner at Mondar's residence. Over the dinner table Cletus brought the Exotic up to date. Mondar listened with interest which increased visibly when Cletus got into the matter of the special training in auto-control he had initiated for the officers and men who would be under his command. After the dinner was over they strolled out onto one of the many terraces of Mondar's home to continue their talk under the night sky.

"And there," said Cletus, as they stood in the warm night breeze, looking upward. He pointed at a yellowish star low on the horizon. "That'll be your sister world, Mara. I understand you Exotics have got quite a colony there, too."

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"Oh, yes," answered Mondar thoughtfully, gazing at the star.

"A pity," said Cletus, turning to him, "that they aren't as free there from Alliance and Coalition influence as you've been here on Kultis since the Neulanders were taken care of."

Mondar withdrew his eyes from the star, turned himself to face Cletus, and smiled.

"You're suggesting we Exotics hire your new Battle Unit to drive out the Alliance and Coalition forces?" he said, on humorous note. "Cletus, we've strained our financial resources for you already. Besides, it's counter to our general philosophy to contemplate deliberate conquest of other peoples or territories. You shouldn't suggest it to us."

"I don't," said Cletus. "I only suggest you contemplate the building of a core tap power station at the Maran North Pole."

Mondar gazed through the darkness at Cletus for a moment without speaking.

"A core tap power station?" he echoed at last, slowly. "Cletus, what new subtlety are you working at now?"

"Hardly a subtlety," replied Cletus, "it's more a matter of taking a square look at the facts on Mara, economic and otherwise. The Alliance and the Coalition are both still stretched to their economic limits to maintain their influence with various colonies on all the New Worlds. They may have lost ground here. But they're both strong on Mara, on Frieland and New Earth under Sirius, on Newton and Cassida, and, even to a certain extent, on the younger Old Worlds of the Solar System—Mars and Venus. In fact, you might say they're both overextended. Sooner or later they're bound to crack—and the one that's liable to crack first, because it's invested more of its wealth and manpower in influencing new world colonies than the Coalition has, is the Alliance. Now, if either the Alliance or the Coalition goes under, the one that's left is going to take over all the influence that the other formerly had. Instead of two large octopuses with their tentacles into everything on the New Worlds, there'll be one extra-large octopus. You don't want that."

"No," murmured Mondar.

"Then it's plainly to your interests to see that, on some place like Mara, neither the Alliance nor the Coalition gets the upper hand," said Cletus. "After we took care of Neuland, and you invited the Alliance forces out, the personnel the Alliance had here were taken away and spread out generally—plugged in any place the Alliance seemed in danger of springing a leak in confrontation with the Coalition. The Coalition, on the other hand, took its people in Neuland—of which, granted, there weren't as many as there were of Alliance people, but

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it was a fair number—and simply shifted them over to Mara. The result is that the Coalition is headed toward getting the upper hand over the Alliance on Mara."

"So you're suggesting we hire some of these newly trained Dorsais of yours to do on Mara what you did here?" Mondar smiled at him, a little quizzically. "Didn't I just say that philosophically we Exotics consider it inadvisable to improve our position by conquest—or any violent means, for that matter. Empires built by force of arms are built upon sand, Cletus."

"In that case," said Cletus, "the sand under the Roman Empire must have been most solidly packed. However, I'm not suggesting any such thing. I'm merely suggesting that you build the power plant. Your Exotic colony of Mara occupies the subtropical belt across the one large continent there. With a core tap power station at the North Pole, you not only extend your influence into the essentially unclaimed sub-Arctic regions there, you'll be able to sell power to all the small independent temperate-zone colonies lying between Mara and the station. Your conquest on that planet, if any, will be by peaceful and economic means."

"Those small colonies you refer to," said Mondar, his head a little on one side, watching Cletus out of the corners of his blue eyes, "are all under Coalition influence."

"All the better," said Cletus. "The Coalition can't afford very well to drill them a competing core tap power plant."

"And how are we going to afford it?" Mondar asked. He shook his head. "Cletus, Cletus, I think you must believe that our Exotic peoples are made of money."

"Not at all," Cletus said. "There's no need for you to put yourself to any more immediate expense than for the basic labor force required to set up the plant. It ought to be possible for you to set up an agreement for a lease-purchase on the equipment itself, and the specially trained people required to set up the plant."

"Where?" asked Mondar. "With the Alliance? Or the Coalition?"

"Neither," said Cletus, promptly. "You seem to forget there's one other colonial group out here on the New Worlds that's proved itself prosperous."

"You mean the scientific colonies on Newton?" said Mondar. "They're at the extreme end of the philosophical spectrum from us. They favor a tight society having as little contact with outsiders as possible. We prize individualism above anything else; and our whole purpose of existence is the concern with the total human race. I'm afraid there's a natural antipathy between the Newtonians and us."

Mondar sighed slightly. "I agree we should find a way around such an emotional barrier between us and

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other human beings. Nonetheless, the barrier's there. In any case, the Newtonians aren't any better off financially than we are. Why should they extend us credit, equipment, and the services of highly trained people—as if they were the Alliance itself?"

"Because eventually such a power station can pay back their investment with an excellent profit—by the time the lease expires and you purchase their interest in it back from them," said Cletus.

"No doubt," said Mondar. "But the investment's still too large and too long-ranged for people in their position. A man of modest income doesn't suddenly speculate on distant and risky ventures. He leaves that to richer men, who can afford the possible loss—unless he's a fool. And those Newtonians, whatever else they are, aren't fools. They wouldn't even listen."

"They might," said Cletus, "if the proposition was put to them in the proper manner. I was thinking I might say a word to them myself about it—if you want to authorize me to do that. I'm on my way there now, to see if they might not want to hire some of our newly-trained Dorsai troops."

Mondar gazed at him for a second, and the Exotic's eyes narrowed.

"I'm utterly convinced, myself," he said, "that there's no chance in the universe of your persuading them to anything like this. However—we'd stand to gain a great deal by it. I don't see how we could possibly lose anything by your trying. If you like, I'll speak to my fellow Exotics. Both about the project and about your approaching the Newtonians for equipment and experts to put it in."

"Fine. Do that," said Cletus. He turned back into the house. "I imagine I should start folding up, then. I want to inspect the Dorsai troops in the regiment you've got here now; and set up some kind of rotation system so that we can move them back by segments to the Dorsai for the new training. I want to be on my way to Newton by the end of the week."

"I should have our answer for you by that time," said Mondar, following him in. He glanced curiously at Cletus as they moved into the house side by side. "I must say I don't see what you stand to gain by it, however."

"I don't, directly," Cletus answered. "Nor do the Dorsais—we Dorsais. I have to get used to saying. But didn't you say something to me once yourself about how anything that moved mankind as a whole onward and upward also moved you and your people toward their long-term goal?"

"You're interested in our long-term goal now, then?" Mondar asked.

"No. In my own," said Cletus. "But in this case it amounts to the same thing, here and there."

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He spent the next five days in Bakhalla briefing the Dorsai officers there on his training program back on the Dorsai. He invited those who wished to return and take it, along with those of their enlisted men who wished the same thing. He left them with a sample plan for rotation of troops to that end—a plan in which his own already-trained men on the Dorsai would fill in for those of the Bakhallan troops that wished to take the training, collecting the pay of those they replaced for the training period.

The response from the Dorsais in Bakhalla was enthusiastic. Most of the men there had known Cletus at the time of the victory over Neuland. By this means, therefore, Cletus was able to extend the value of the loan he had made from the Exotics, since he did not have to find jobs immediately for those Dorsais he had already trained, but could use them several times over as replacements for other men wishing to take the training. Meanwhile, he was continually building up the number of Dorsais who had been trained to his own purposes.

At the end of the week he took ship for Newton, bearing credentials from the Exotics to discuss the matter of a core tap power station on Mara with the Newtonian Governing Board, as an ancillary topic to his own search for employment for his Dorsais.

Correspondence with the Board had obtained for him an appointment with the Chairman if the Board, within a day of his arrival in Baille, largest city and defacto capital of the Advanced Associated Communities as the combined colonies of technical and scientific immigrants to Newton had chosen to call themselves. The chairman was a slim, nearly-bald, youthful-faced man in his fifties, by the name of Artur Walco. He met with Cletus in a large, clean—if somewhat sterile—office of a tall building as modern as any on Earth.

"I'm not sure what we have to talk about, Colonial," Walco said when they were both seated on opposite sides of a completely clean desk showing nothing but a panel of controls in its center. "The AAC is enjoying good relationships currently with all the more backward colonies of this world."

It was a conversational opening gambit as standard as king's pawn to king's pawn four in chess. Cletus smiled.

"My information was wrong, then?" he said, pushing his chair back from the desk and beginning to stand up. "Forgive me. I—"

"No, no. Sit down. Please sit down!" said Walco, hastily. "After you've come all the way here, the least I can do is listen to what you would've told me."

"But if there's no need your hearing—" Cletus was insisting, when Walco once more cut him short, with a wave of his hand.

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"I insist. Sit down, Colonel. Tell me about it," he said. "As I say, there's no need for your mercenaries here at the moment. But any open-minded man knows that nothing's impossible in the long-run. Besides, your correspondence intrigued us. You claim you've made your mercenaries more efficient. To tell you the truth, I don't understand how individual efficiency can make much difference in a military unit under modern conditions of warfare. What if your single soldier *is* more efficient? He's still just so much cannon-fodder, isn't he?"

"Not always," said Cletus. "Sometimes he's a man behind the cannon. To mercenaries, particularly, that difference is critical, and, therefore, an increase in efficiency becomes critical, too."

"Oh? How so?" Walco raised his still-black, if narrow, eyebrows.

"Because mercenaries aren't in business to get themselves killed," said Cletus. "They're in business to win military objectives *without* getting themselves killed. The fewer casualties, the greater profit—both to the mercenary soldier and to his employer."

"How, to his employer?" Walco's eyes were sharp.

"An employer of mercenaries," Cletus answered, "is in the position of any businessman, faced with a job that needs to be done. If the cost of having it done equals, or exceeds, the possible profit to be made from it, the businessman is better off leaving the job undone. On the other hand, if the cost of having it done is less than the benefit, or profit, to be gained, then hiring the work accomplished is a practical decision. The point I'm making is that with more efficient mercenary troops, military actions which were not profitable to those wishing them accomplished, now become practical. Suppose, for example, there existed a disputed piece of territory with some such valuable natural resource as stibnite mines—"

"Like the Broza Colony stibnite mines the Brozans stole from us," shot out Walco.

Cletus nodded.

"It's the sort of situation I was about to mention . . ." he said. "Here we have a case of some very valuable mines out in the middle of swamp and forest stretching for hundreds of miles in every direction, without a decent city to be found, worked and held on to by a backward colony of hunters, trappers and farmers. A colony though which is confirmed in possession of the mines by military forces supplied by the Coalition. That same Coalition, which takes its cut of the high prices you pay the Brozans for the antimony extracted from the stibnite."

Cletus stopped speaking and looked meaningfully at Walco. Walco's face had darkened.

"Those mines were discovered by

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us and developed by us on land we'd bought from Broza Colony," he said. "The Coalition didn't even bother to hide the fact that they'd instigated the Brozan's expropriation of them. It was piracy, *literal piracy*," Walco's jaw muscles tightened. His eyes met Cletus's across the desk top. "You picked an interesting example," he said. "Just as a matter of theoretical interest, suppose we do go into the matter of expense, and the savings to be gained by the efficiency of your Dorsais in just this one instance . . ."

A week later, Cletus was on his way back to the Dorsai with a contract for the three months hire of two thousand men and officers. He stopped at Bakhalla on Kultis on the way back to inform the Exotics that their loan was already promising to pay off.

"Congratulations," said Mondar. "Walco has a reputation of being one of the hardest men on any world to deal with. Did you have much trouble persuading him?"

"There was no persuading involved," answered Cletus. "I studied the situation on Newton for a point of grievance, before I wrote him originally. The stibnite mines, which are essentially Newton's only native source of antimony, seemed ideal. So, in my correspondence after that I dwelt upon all those aspects and advantages of our troops under this new training, which would apply to just such a situation—but without ever mentioning the Brozan stibnite mines by name. Of course, he could hardly help apply the information I gave him to that situation. I think he was determined to hire us to recover the mines even before he met me. If I hadn't brought up the subject, he would have."

Mondar shook his head with a slow smile of admiration.

"Did you take advantage of his good humor to ask him to consider the Maran core tap plan?"

"Yes," said Cletus. "You'll have to send a representative to sign the actual papers, but I think you'll find he'll be falling over himself in his eagerness to sign the agreement."

The smile vanished from Mondar's face.

"You mean he's seriously interested?" Mondar demanded. "He's interested in a situation in which they'd put up that kind of equipment and professional services simply in return for a long-term financial gain?"

"He's not merely interested," said Cletus. "You'll find he's pretty well determined not to let the chance get away, no matter what. You should be able to write your own terms."

"I can't believe it!" Mondar stared at him. "How in the name of eternity did you get him into such a favorable mood?"

"There wasn't any real prob-

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lem," said Cletus. "As you say, the man's a hard bargainer—but only when he's bargaining from a position of strength. I began, after our talk about the Dorsais was done, by just dropping the hint that I was on my way to Earth, where I had family connections who'd help me in getting Alliance funds to help you set up the Maran core tap. He was interested, of course—I think, at first, more in the prospect of getting some such sort of Alliance aid for Newton. But then I happened to dwell on some of the financial benefits the Alliance would receive in the long run, in return for their help, and that seemed to start him thinking."

"Yes," murmured Mondar. "the Newtonian appetite for credit is real enough."

"Exactly," Cletus said. "Once he showed that appetite, I knew. I had him hooked. I kept drawing him on until he, himself, suggested his Advanced Associated Communities might possibly be interested in putting up a small share themselves—perhaps supplying twenty percent of the equipment, or an equivalent amount of the trained personnel, in return for no more than a five-year mortgage on property here on Bakhalla."

"He did?" Mondar's face became thoughtful. "It's a steep price, of course, but considering our chances of actually getting Alliance money is practically nonexistent—"

"Just what I told him," interrupted Cletus. "The price was so steep as to be ridiculous. In fact, I laughed in his face."

"You did?" Mondar's gaze sharpened. "Cletus, that wasn't wise. An offer like that from a Chairman of the Board on Newton—"

"—Is hardly realistic, as I frankly told him," said Cletus. "I wasn't likely to put myself in the position of carrying an offer from them to you that was penurious to the point of insult. After all, as I told him, I had an obligation to my Dorsais to maintain good relationships with the governments of *all* independent New Worlds colonies. And on second thought, I'd even begun to feel a little doubtful that I ought to have mentioned the matter to him at all. After all I'd only been given authority to speak to my relatives and contacts back on Earth."

"And he stood for that?" Mondar stared at Cletus.

"He not only stood for it," said Cletus, "he didn't waste any time in apologizing and amending his offer to a more realistic level. However, as I told him, by this time I was beginning to feel a little bit unsure about the whole business where he was concerned. But he kept on raising his offer until he was willing to supply the entire amount of necessary equipment, plus as many trained people as necessary to drill the core tap and get it into oper-

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ation as a power source. I finally agreed—reluctantly—to bring that offer back to you before going on to Earth."

"Cletus!" Mondar's eyes were alight. "You did it!"

"Not really," said Cletus. "There was still that matter of the Newtonians requiring Bakhallan property as security in addition to a mortgage on the core tap itself. I was due to leave the next day, so early that morning before I left, I sent him a message saying I'd thought it over during the night, and, since there was absolutely no doubt that the Alliance would be happy to finance the project with a mortgage merely on the basis of the core tap mortgage alone, I'd decided to disregard his offer after all and go directly on to Earth."

Mondar breathed out slowly.

"With that much of an offer from him already in your hands," he said—and from anyone but an Exotic the tone of the words would have been bitter—"you had to gamble on a bluff like that!"

"There wasn't any gamble involved," said Cletus. "By this time the man had talked himself into buying a piece of the project at any cost. I believe I could even have gotten more if I hadn't already implied the limits of what the Alliance would do. So, it's just a matter of your sending someone to sign the papers."

"You can count on that. We won't waste time," answered Mondar. He shook his head. "We'll owe you a favor for this, Cletus. I suppose you know that."

"The thought would be a strange one to overlook," said Cletus, soberly. "But I'm hoping Exotics and Dorsais have stronger grounds for mutual assistance in the long run, than just a pattern of reciprocal favors."

He returned to the Dorsai, eight days later, ship's-time, to find the three thousand men about whom he had messaged from Newton, already mobilized and ready to embark. Of these, only some five hundred were new-trained Dorsais. The other twenty-five hundred were good, solid, mercenary troops from the planet, but as yet lacking in Cletus's specialized training. However, that fact did not matter, since the untrained twenty-five hundred would be essentially, according to Cletus's plans, along only for the ride.

Meanwhile, before he and they left for Newton in three days time, there was his marriage to Melissa to accomplish. The negotiations at Bakhalla and on Newton had delayed him. As a result, he arrived—having messaged ahead that he would be there in time for the ceremony if he had to hijack an atmosphere ship to make it—less than forty-five minutes short of the appointed hour. All this, only to find the first news to greet him was that perhaps all his hurry had been needless.

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"She says she's changed her mind, that's all," Eachan Khan said to Cletus, low-voiced, in the privacy of the shadowed dining room. Behind Eachan's stiff shoulders, Cletus could see some thirty feet away, the chaplain of his regiment of new-trained Dorsais, along with the other guests, eating and drinking in light-hearted ignorance of the sudden, drastic change in plans that had come upon the occasion. The gathering was made up of old friends of Eachan; and new, but equally fast, friends and officers of Cletus. Among the mercenaries, loyalties were apt to be hard-won, but once won, unshakable. Those who were friends of Cletus outnumbered those of Eachan by more than two to one. Cletus had set up the invitation list that way.

"She says there's something wrong," said Eachan, helplessly, "and she has to see you. I don't understand her. I used to understand her, before deCastries—" he broke off. His shoulders sagged under the jacket of his dress uniform. "But not any more."

"Where is she?" asked Cletus.

"In the garden. The end of the garden, down beyond the bushes in the summerhouse," said Eachan.

Cletus turned and went out one of the French windows of the dining room toward the garden. Once he was out of sight of Eachan, inside the house however, he circled around to the parking area and the rented car he had flown out here from Foralie.

Opening the car, he got out his luggage case and opened it. Inside were his weapon belt and sidearm. He strapped the belt around his waist, discarding the weather-flap that normally protected the polished butt of the sidearm. Then he turned back toward the garden.

He found her where Eachan had said. She was standing in the summerhouse with her back to him, and her hands on the white railing before her, looking through a screen of bushes at the far ridge of the surrounding mountains. At the sound of his boots on the wooden floor of the summerhouse, she turned to face him.

"Cletus!" she said. Her face was quite normal in color and expression—only, her lips were a little set. "Dad told you?"

"Yes," he answered, stopping in front of her. "You should be inside getting ready. As it is we're going to have to go ahead just the way we are."

Her eyes widened slightly. A look of uncertainty crept into them.

"Go ahead—?" she echoed. "Cletus, haven't you been up to the house, first? I thought you said you'd already talked to Dad."

"I have," he said.

"Then . . ." she stared at him. "Cletus, didn't you understand what he said? I told him—it's wrong. It's just wrong. I don't

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know what's wrong about it, but something is. I'm not going to marry you!"

Cletus looked at her. And, as she gazed back at him, Melissa's face changed. There crept into her face that expression that Cletus had seen her wear only once before. It was the look he had seen on her face after emerging alive from the ditch in which he had played dead in order to destroy with the dally gun the Neulander guerrillas who had attacked their armored car on its way into Bakhalla.

"You don't . . . you can't think," she began, barely above a whisper. But then her voice firmed. "You can *force* me to marry you?"

"We'll hold the ceremony," he said.

She shook her head, disbelievingly.

"No Dorsai chaplain would marry me against my will!"

"My regimental chaplain will—if I order it," Cletus said.

"Marry the daughter of Eachan Khan?" she blazed, suddenly. "And I suppose my father's simply going to stand still and watch this happen?"

"I hope so—sincerely," answered Cletus, with such a slow and meaningful emphasis on the words that color leaped into her face for a second and then drained away to leave her as pale as a woman in shock.

"You . . ." Her voice faltered and stopped. Child of a mercenary officer, she could not have failed to notice that among those present for the wedding, those bound to Cletus by emotional or other ties, outnumbered those bound to her father by two to one. But her eyes on him were still incredulous. They searched his face for some indication that what she saw there was somehow not the true Cletus.

"But you're not like that. You wouldn't . . ." Her voice failed again. "Dad's your friend!"

"And you're going to be my wife," Cletus answered.

Her eyes fell for the tirst time to the sidearm in the uncapped holster at his waist.

"Oh, God!" She put a slim hand to each side of her face like someone in deep shock. "And I thought Dow was cruel! I won't answer. When the chaplain asks me if I'll take you for my husband, I'll say no!"

"For Eachan's sake," said Cletus. "I hope not."

Her hands fell from her face. She stood like a sleepwalker, with her arms at her sides.

Cletus stepped up to her, took her arm and led her unresisting out of the summerhouse up the garden, through a hedge and back in through the French windows to the dining room where he had left Eachan earlier. Eachan was still there; and the older man turned to face them quickly as they came in, putting down the glass he held and stepping forward to meet them.

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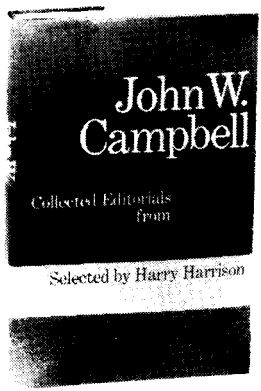

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"Here you are!" he said. His gaze sharpened suddenly on his daughter. "Melly! What's the matter?"

"Nothing," Cletus answered. "There's no problem, after all. We're going to get married."

Eachan's gaze switched sharply to Cletus.

"You are?" His eyes locked with Cletus's for a second; then went back to Melissa. "Is this right, Melly? Is everything all right?"

"Everything's fine," said Cletus. "You'd better tell the chaplain we're ready now."

Eachan did not move. His eyes raked downward and stared deliberately at the weapon in its holster on Cletus's hip. He looked back up at Cletus, and then at Melissa.

"I'm waiting to hear from you, Melly," Eachan said slowly. His eyes were as gray as weathered granite. "You haven't told me yet that everything's all right."

"It's all right," she said between stiff, colorless lips. "It was your idea I marry Cletus, in the first place, wasn't it, Dad?"

"Yes," said Eachan. There was no noticeable change in his expression, but all at once a change seemed to pass over him, sweeping away all emotion and leaving him quiet, settled and purposeful. He took a step forward, so that he stood now almost between them,

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looking directly up into Cletus's face from a few inches of distance. "But perhaps I was making a mistake."

His right hand dropped, as if casually, to cover Cletus's hand where it held Melissa's wrist. His fingers curled lightly about Cletus's thumb in a grip which could be used to break that thumb if Cletus's hand did not release its hold.

Cletus dropped his hand lightly upon the belt of the weapon at his side.

"Let go," he said softly to Eachan.

The same deadly quietness held them both. For a second there was no movement in the room; and then Melissa gasped.

"No!" She forced herself between them, facing her father, her back toward Cletus with his hand still holding her wrist, now behind her back. "Dad! What's the matter with you? I'd think you'd be happy we've decided to get married, after all! And here, you're acting like this!"

Behind her, Cletus let go of her wrist and she brought the formerly imprisoned arm around before her. Her shoulders lifted sharply with the depth of her breathing. For a moment Eachan stared at her blankly, and then a little touch of puzzlement and dismay crept into his eyes.

"Melly, I thought . . ." His voice stumbled and fell silent.

"Thought?" cried Melissa, sharply. "What, Dad?"

He stared at her, distractedly.

"I don't know!" he exploded, all at once. "I don't understand you, girl! I don't understand you at all!"

He turned away and stamped back to the table where he had set down his drink. He picked it up and swallowed heavily from it.

Melissa went to him and for a second put her arm around his shoulders, laying her head against the side of his head. Then, she turned back to Cletus and placed a cold hand on his wrist. She looked at him with eyes that were strangely deep and free of anger or resentment.

"Come along, Cletus," she said, quietly. "We'd better be getting started."

It was some hours later before they were able to be alone together once more. The wedding guests had seen them to the very door of the master bedroom in newly-built Grahame-House; and it was only when that door was shut in their faces that they finally left the building, the echo of their laughter and cheerful voices fading behind them.

Wearily, Melissa dropped into a sitting position on the edge of the large bed. She looked up at Cletus, who was still standing.

"Now, will you tell me what's wrong?" she asked.

He looked at her. The moment he had foreseen when he had asked

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her to marry him was upon him now. He summoned up courage to face it.

"It'll be a marriage in name only," he said. "In a couple of years you can get an annulment."

"Then why marry me at all?" she said, her voice still empty of blame or rancor.

"DeCastries will be back out among the New Worlds within another twelve months," he said. "Before he came, he'd be asking you to come to Earth. With your marriage to me, you lost your Earth citizenship. You're a Dorsai, now. You can't go—until you've had the marriage annulled and reapplied for Earth citizenship. And you can't annul the marriage right away without letting Eachan know I forced you to marry me—with the results you know, the same results you agreed to marry me to avoid, right now."

"I would never let you two kill each other," she said. Her voice was strange.

"No," he said. "So you'll wait two years. After that, you'll be free."

"Why did you do it?" she asked.

"Eachan would have followed you to Earth," said Cletus. "That's what Dow counted on. That's what I couldn't allow. I need Eachan Khan for what I've got to do."

He had been looking at her earlier as he talked. But now his eyes had moved away from her. He was looking out the high, curtained window at one end of the bedroom, at the mountain peaks, now just beginning to be clouded with the afternoon rains that would in a few months turn to the first of autumn snows. She did not speak for a long minute.

"Then," she said, at last, "you never did love me?"

He opened his mouth to answer, for the moment was upon him. But at the last minute, in spite of his determination, the words changed on his lips.

"Did I ever say I did?" he answered; and, turning, went out of the room before she could prolong the conversation.

But behind him, as he closed the door, there was only silence.

TO BE CONCLUDED

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ALL THE AWARDS

One of the questions that comes most frequently to this department—really, it's two questions—is: "What stories won the Hugo and International Fantasy awards, and what were the runners-up?"

An answer would mean hunting back through nearly twenty years of fan publications—which I don't have, and never did have, because I've never been active in fandom. So—no answer. That is, it would have meant all this work until just now. Now two veteran SF fans, Donald Franson and Howard DeVore, have done the job for me. "A History of the Hugo, Nebula and International Fantasy Award, Listing Nominees & Winners, 1951—1969" is available from Science-fiction Sales, 4705 Weddel Street, Dearborn, Michigan 48125, for—at the moment—sixty-five cents. Howard hasn't mimeographed many, but he plans to keep it in print, though the price may go up.

I have no intention here of stealing their stuff and answering your questions. I couldn't: it runs to forty-five full-sized pages, mimeographed. Donald Franson has compiled the history—and it's a particularly tangled history—of the Science Fiction Achievement Awards which convention members have made nearly every year since the Philadelphia convention (Philcon II) in 1953, and added two pages on the short-lived International Fantasy Awards. Howard DeVore has added a section on the Nebula Awards made by the Science Fiction Writers of America since 1965.

The International Fantasy Awards, I'd say, are the most prestigious ever made in the science fiction/fantasy field. They were launched by a group of British fans, including John Beynon Harris—"John Wyndham"—for the 1951 British convention, and were

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made every year except 1956 until 1957. For the first three years there were both fiction and non-fiction awards—always to books—thereafter only for fiction. The originating committee, probably with the advice of other British fans, named the first two award winners; thereafter a panel of British and American reviewers made the selections. Membership of the panel varied; I was in on the last one or two.

All of the IFA winners are books that readers, including readers outside the science-fiction family, have remembered and will go on remembering for a long time—something which, unfortunately, can't always be said of the fan-selected "Hugos." Books that won the Award, and should have had the double recognition of a Hugo, didn't get it—possibly because they already had a prize. Since this list isn't well known, I'll repeat it here.

The International Fantasy Awards for 1951 went to George R. Stewart's "Earth Abides" and "The Conquest of Space," by Willy Ley and Chesley Bonestell. The 1952 awards went to John Collier's short story collection, "Fancies and Goodnights," and to Arthur Clarke's "The Exploration of Space." In 1953, the year of the first Hugo, Clifford D. Simak won with "City" and Willy Ley and Sprague de Camp with "Lands Beyond." Theodore Sturgeon's "More Than Human" richly deserved the 1954 award—*his only award*, believe it or not—Edgar Pangborn's "A Mirror for Observers" won in 1955, and the great Tolkien "Lord of the Rings" trilogy brought the IFA series to a distinguished end in 1957.

The Science Fiction Achievement Awards were inaugurated by the Philcon committee in 1953; they are nicknamed "Hugo" for, of course, Hugo Gernsback. The 1954 committee may have thought this was just a promotional stunt, but in 1955 the Cleveland committee reinstated the awards and Cleveland fan Ben Jason designed the chrome-plated rocket which—with vastly varying bases—has been its symbol ever since, except at the 1957 London convention. Categories have changed almost from year to year, and you really need the Franson-DeVore booklet to keep track of them. We finally had the sense to give Mr. Gernsback his own award at the Pittcon in 1960, and Washington gave this department a special in 1963.

The Hugo awards are made by a mail ballot of the enrolled members of the annual science-fiction convention—this year it's in Heidelberg. In the beginning, anyone could nominate a story or publication; now the members do that, too. In the hope of getting a more critical evaluation, the Science Fiction Writers of America (SFWA) inaugurated the Nebula awards in 1965.

Some of the finest writers in the

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field have never had an award, and others have won for a poorer book than some that missed. Theodore Sturgeon, as I've said, did win the IFA for "More Than Human," but he has never won a Hugo—though he has had five nominations and one Nebula nomination. Sturgeon's best work appeared before the awards existed, but this certainly isn't true of "Cordwainer Smith," who at the time his unique stories were appearing never received an award and reached the finals only twice. Philip José Farmer and Edgar Pangborn made it once, though both have had other nominations. (The booklet lists only the stories in what the British call the "short list"—the ballot from which the final awards were made. I find it hard to believe that writers like these weren't nominated at all, but the nomination records are long since lost.)

Harlan Ellison is all-time champion with seven awards since 1965—two Nebulas and five Hugos, including one for a "Star Trek" script and one for editing the "New Wave" giganthology, "Dangerous Visions." (He's at work on an even more gigantic anthology of new stories in the new mode.)

Robert Heinlein has never failed to get a book into the finals, and four of them have won. Fritz Leiber also has four awards, two for novels—not his best—and two for middle-length stories. In the younger generation, Samuel R. Delany and Roger Zelazny have both received four awards—in both cases, two for novels, two for novella/novelette-length stories.

Four writers who might be considered Old Guard have three awards on their mantles. Clifford D. Simak deserves to lead the list because of his International Fantasy Award for "City," but he is in the very good company of Poul Anderson, Jack Vance and Robert Silverberg. Bob Silverberg may wince at the fact that his first Hugo, for "most promising author," was made thirteen years before he took a Hugo and a Nebula in the same year for different stories. (His really outstanding recent novels haven't made it, for some reason.)

Finally, six authors have two awards—in every case but one (Walter M. Miller) a Nebula and a Hugo. Frank Herbert took both awards for "Dune," as did Daniel Keyes for "Flowers for Algernon," but Keyes won once for the original novelette, and again for the novel. (He also got into the finals with the TV program and film based on his story.) Anne McCaffrey got an award for each of the two parts of "Dragonrider"—the versions published in Analog—but not for the complete book. Gordon Dickson and Brian Aldiss are also two-time winners.

The drama field—films, television and radio—has been notable for thumping "No Award!" votes, but

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the "Twilight Zone" series won three times and "Star Trek" also got three awards, including a special to its producer, Gene Roddenberry.

Ed Emshwiller has been by all odds the most popular cover artist, with a row of five Hugos on his shelf. Kelly Freas has won four times, mainly for his Astounding Analog covers and interior illustrations.

And, lest we forget, there is also a Hugo for best professional magazine (the British, in 1957, made separate awards to American and English magazines and *New Worlds*—the old *New Worlds*—got a well-deserved award at a time when it was the English counterpart of Astounding in developing new authors). John Campbell has eight of them somewhere for Astounding/Analog. *Fantasy & Science Fiction* has won five times, and *If* three times.

For the whole story, you need the Franson/DeVore "History."

THE STARKAHN OF RHADA
By Robert Cham Gilman • Harcourt, Brace & World, New York • 1970 • 190 pp. • $4.95

If the annual science-fiction conventions gave a "Hugo" for the best juvenile science fiction—and they should—the longtime championship of Andre Norton would be seriously threatened by the "Rhada" stories by Robert Cham Gilman. The three books are not quite the surprise that the appearance of John Boyd has been, for the "Cumulative Book Index" reports that "Gilman" is a pen name for Alfred Coppel, a writer who has a good few stories to his credit under his own name.

Gilman is writing about intrigue in a galactic empire of the very far future—just how far, we finally learn in this book. Earth has become the center of a galactic empire(the new calendar of the Galactic Era begins with A.D. 6000 of our era). The empire collapsed in an interregnum in which science was carried on as a religious cult by the Navigators . . . then a Second Empire grew faster and farther than the first. Instead of following one character through a limited part of this tremendous turmoil, the author has placed each of his books in a different era. "The Rebel of Rhada" was a story of the young Starking Kier in about 6000 G.E. "The Navigator of Rhada" picked up the story of young Kynan, some two centuries later. Now we are introluced to another Starking, namesake of Kier, 800 years after the events of "Navigator."

The new Kier is a scholar and student of history, doing his stint as a space scout in partnership with the cyborg ship *Ariane*. (Much as I hate to say it, *Ariane* makes her counternart in Anne McCaffrey's "Ship Who Sang" just a little bit bland.) In the depths of space, the partners come upon a gigantic

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black ship orbiting an obscure star, and Kier bullheadedly goes in to investigate. He finds that it is an automated fortress with one human passenger, a strange silver-eyed girl held in suspended animation in a sealed chamber. He gets her out, just as the ship goes berserk and destroys a star. And *then* the trouble starts . . .

The girl, Marissa, is one of a society of mutants, descended from refugees who were shipped off to the Lesser Magellanic Cloud as political "criminals" during a short-lived episode in the First Empire, ten thousand years before. Three death ships have been built and sent back to ravage the Empire: two have vanished, and this third ship is partially disabled.

The girl, revived, becomes a political pawn in the hands of a fanatic Navigator clique. The dying Vulk, Gret, sends Kier and his cyborg partner, with his own mate, Erit, to steal the mutant girl from the "warlocks" who have revived her, and persuade her to stop the death ship. Only it develops that it will no longer obey her.

"Robert Cham Gilman" has earned himself a place in the field that Poul Anderson and Gordon Dickson, in particular, have kept fresh and lively. His books are not watered down, his people and creatures are real, and the social forces that move them are ones we can recognize in our own time. He suggests ramifications of future society that he might describe in books for adults. The "Rhada" series was announced as a trilogy, but I hope he won't cut it short now.

ALL JUDGMENT FLED

By James White • Walker and Co., New York • 1969 • 215 pp. • $4.95

Walker is bringing out some good original science fiction together with an excellent line of hardback reprints of paperback classics—books that will now get into libraries. Anne McCaffrey's "The Ship Who Sang" is one of them, that I unfortunately didn't see until the paperback came out. This is a good, if not exceptional, First Contact story.

A gigantic ship appears out of space, moves into the solar system—and just lies there. Two teams are sent out to make contact: four astronauts and two scientists, all under military command. They are an ill-chosen crew, and personal tensions begin to develop, not much helped by the Voice of Authority back on Earth, constantly dinning in their ears.

Matters are bad enough before they reach the Ship, but they rapidly grow worse. They break in . . . begin to explore . . . then find themselves in open warfare with malignant creatures in the Ship. Are they the voyagers from the stars, or are they food animals, experimental animals, that have es-

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caped and taken over? What is the secret of the Ship's stellar drive, and how can it be fathomed? Meanwhile, back home, Earth is in the midst of a turmoil brought on by the uncensored broadcasts from the Ship and not unlike the division we see around us today. Politics . . . military protocol . . . doctrinaire liberalism and equally doctrinaire authoritarianism . . . everyone has to get into the act. Meanwhile five men inside the Ship and one marooned in their own vessel are probing and fighting.

It moves. It does indeed. But an A-bomb gets lost somewhere.

A CIRCUS OF HELLS

By Poul Anderson • Signet Books, N.Y. • No. T-4250 • 160 pp. • 75c

Here is another exploit—really, two exploits—of Dominick Flandry. It seems to me to fall second of the published books, after "Ensign Flandry"—he is now a Lieutenant, j.g. in Naval Intelligence—but before "The Rebel Worlds." He does not yet have the full dread of the Long Night that motivates him later, but he is developing some of the qualities that get him in trouble—and out—in the human conflict with the reptilian Merseians. Among these is the conviction that the end may indeed justify whatever means the situation seems to call for.

I said that the book really contains two stories. The first part, in which Flandry and a female companion foisted on him by men and Merseians of ill will visit a robot-dominated planet, was in *Galaxy* last year as "The White King's War." Escaping from Wayland, he is trapped by Merseians who have an outpost and research station much too close to the frontiers of the human Empire. This gives the author another opportunity to invent—rather, construct—another strange world and an even stranger population for it. Indeed, Talwin has two sapient races—one in winter, the other for summer—both evolved in response to the planet's extraordinary cycle of seasons.

The best part of the book, though, is the portrait of the Merseian noble and scientist, Ydwyr, which shows how "human" these inhuman monsters really are, judged by their own values. Ydwyr is a dragon as believable as Anne McCaffrey's—and as human.

As a matter of fact, you get the benefit of three of Poul Anderson's experiments in astrofiction, for Flandry and Djana, in their escape from Talwin and the Merseians, have to take advantage of the very strange kind of distorted space that exists in the neighborhood of a neutron star.

It's minor Flandry and it's minor Anderson, but you'll make a mistake if you miss it. This is the best of "square" science fiction—and I do *not* mean "speculative fantabulation."

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brass tacks

Dear Mr. Campbell:

Having taken on the fuzz, the militia, the courts, professors, and what have you, the young world-savers are now taking on the forces of nature. They are turning to the use of explosive forms of protest to make their case, and from what appears in the news, they are finding that one does not treat boomstuff like Judge Hoffmann. The good judge could glower and sentence them variously, but when one trifles with sensitive nitrates, they always do the same thing. Hence one gap in the street front in Greenwich Village, a pile of junk in Maryland, and one lad in a New York hospital minus both arms below the elbow.

Trouble is, that while it is easy to *buy* dynamite or explosives and initiators, it is also easy to swipe or make them. I recently heard of an Ohio theft of 3 tons of dynamite! In two cases where dynamite was purchased, remaining sticks allowed the tracing of the sources, and the barn could be locked, Dobbin having been stolen.

Manufacture of explosives in the home can be done, using common household gear, but since the little nuances of the process are not covered in most formularies, something may be lost in the process . . . Then all the neighbors find out about it, too . . .

The most easily made explosives are mechanical mixtures, such as old reliable black powder, and the various KCLO3 mixes, such as Berge's Blasting Powder, et cetera. The Army used KCLO3 in chemically-initiated AT mine fuzes a few years back and quit. The fuzes were good, but the KCLO3 had to be so pure that it wasn't economical.

Some years back I ran across an NCO of the Fort Knox EOD crew which handled many an odd deal. His favorite time was the day he and a friend went up to Louisville to check a report on a kid making nitroglycerine on his own. He made up some decomposing solution and signed out for the evening, dressed in Class As. The kid had made nitro, but did not stop at one test tube. M/Sgt. Baird was face to face with a quart of it. They went slowly back to Knox, and Baird hugged the jar tenderly, lest it get all shook up. Such fun!

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The New York *Times* mentioned the lab stock of the last unfortunate bombers, and I think Du Pont ought to get in touch with them, since it stated that they had some *smokeless black powder*. Perhaps they made a new discovery in the field. But, then, again, the *Times* isn't always smart about such things, either. What they don't know about ordnance would fill a Sunday edition . . .

JOHN CONLON
52 Columbia Street
Newark, Ohio 43055

The laws of Nature are always just and fair. Arrogant drop-outs don't do well in making "non-negotiable demands" as to how explosives should act.

Dear John:

Your "Red Tide" editorial hit the nail on the head. For the past couple of years I've been yelling to anyone who would listen that what we need is not an effort to slow down the population growth rate, but to cause it to decline.

This can be accomplished without the aid of World War Three—although I fear that that's what it will take. A case of two mutually solvable problems. If you do a "worst case analysis" of historical causality you have to conclude the absolute certainty of such a war. Of course, worst case analysis has been demonstrated as either pointless, or worse, self-fulfilling. If, as a businessman, I were to base my plans on such, I would have to close up before ever opening. Best guess analysis is more realistic. However, it requires intuition and therefore is unpopular with intellectuals, particularly technical ones.

What we need is a new disease. One which would be mild but would result in either sterility or at least a drastic lowering of fertility. Furthermore, it should be selective and not affect you, me or our friends. Picture a disease for which immunity is obtainable only by eating a high protein diet. As you once pointed out the majority of persons in the industrialized world would qualify to vote based on income restrictions. The same is true of diet. Wiesen's disease would hit the most overpopulated and least industrialized lands hardest.

There is only one hazard. How do we make sure that the disease doesn't mutate? Messing with plagues is dangerous business.

WWIII might be a better answer. But where to hide? As a Ham and amateur navigator, with a wife who's a linguist, perhaps we can ship out on a tramp spacer bound for Zubenelgenubi III. My 14-month-old son can work as cabin boy.

Let me know if you locate such a ship.

DAVID L. WIESEN
18 Wilbur Avenue
Newark, New Jersey 07112

How about a disease that attacks

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only nervous systems that aren't getting much exercise? This gets rid of the mentally lazy, while offering strong reason to everyone to start thinking hard!

Dear Mr. Campbell:

I have just read your editorial where you consider the Red Tide of mankind. As most your editorials it is very comprehensive and logically structured. However there is one factor you left out: it is the American people, rather than mankind in general who are the major environment destroyers.

This nation with roughly ⅔ of 1% of the world's population uses ⅓ of the world resources: minerals, food, energy, et cetera. The fraction of the planet's dry surface where the U.S. lie is not too large, either.

Economic affluence permits a great majority to live in suburbs, and commute to the metropolis for work, this requires primarily cars and its attachments: gas and asphalt. Suburban areas are low density in population, so a great area is urbanized in the benefit of relatively few.

The American consumer will not buy 1 pound of merchandise unless it is beautifully packed in ½ pound of cardboard and plastic.

Public transportation, even in its present state, is more efficient than the thirty cars it replaces. However, except for major cities it is almost nonexistent.

These factors and so many others, product of affluence, are accentuated here as nowhere else in the world.

So, Mr. Campbell, instead of considering the elimination of 80% of the human race, how about eliminating 80% of the disposable income of this country?

AXEL GONZALEZ BRINCK
Baztan 3210,
Santiago-10, Chile

I'd agree the U.S. is worse than any other area—but think how desperately Chile and the rest of the world are struggling to catch up!

Dear Mr. Campbell:

The son will object to the principles of the father. If the father is noisy, the son will want peace. If the father is peaceful, the son will want noise. It is some comfort to know that the students of today will be the fathers tomorrow—and that *their* sons will give *them* hell.

"If you hadn't been a hippie, Dad, maybe we could be living in a better place than this old shack by now."

"You don't know what you're talking about, Son."

"If you hadn't burnt down the college, Dad, I might have stood a better chance of getting an education today."

"You have no idea what it was like in those days, Son."

"If you hadn't campaigned so hard for us to surrender to the Commies, Dad, they wouldn't own

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most of the Pacific like they do now."

"Son, will you shut your mouth? What we did, we did for you, to make a better world for you to live in. You just don't understand, Son."

"No? Well, Dad, I can understand you fighting for the relief of the poor, but I don't know why you had to join their ranks as a fully qualified member."

"We're up against the system, Son. When you get a little older, you'll realize . . ."

"I'll realize then what I realize now, that if you'd done something useful instead of throwing rocks and getting high and gassing flowers, then *I* might have some decent clothes to wear right now."

"And what's wrong with your clothes, huh? What's wrong with that new shirt your mother just wove you, huh? You've got no gratitude, Son. Ma and me, we've worked hard. You don't appreciate the simple life. You don't know what it means to . . ."

"*I* know what it means, oh ho, *do* I, oh boy!"

"Son? Now see. . . . Hey! What are you doing with our rustic chairs? Here, wait a minute, hold on . . . easy with those grass mats, say . . . Son, what's got into you? Why aren't you satisfied? We have everything we need, more berries than we can eat, and . . . Matches, Son? You wouldn't? But why? After all we've done for you! Son, you don't know what you're doing. It was for the best, believe me. If you only knew! Don't you dare set light . . ."

And so on, et cetera, ad lib. Dad may ride off into the sunset of a happy ending, but his son is sure to ride back at sunrise looking for more trouble. Which is all apropos to the assured continuity of normalcy.

Don't ask me, I only write it.

JACK WODHAMS

You mean, "Each generation gets what it earns—not what it intended?"

Dear Mr. Campbell:

Your editorial regarding Mr. Edison's not-so-Magic Lamp touched upon some relevant phases of the anti-technology attitude. There are still some areas open for analysis, however.

1) What happens when industry develops high-yield MHD generators utilizing superconductive magnets and circuitry? This is not too far from practical use—at least in principle. Such generators would rely on common fuels, operate with low wear on components, and would require a relatively more simplified level of design. Pollution effects would be reduced, leaving thermal efflux as the only remaining problem.

2) Allowing for the remarkable effect on technology that the survival instinct produces, consider the development of new, high-yield

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sources of energy. Even if man develops enough power to meet his future requirements—which are staggering—how is he going to route power to the centers of consumption? Copper, as you mentioned, is no longer easy to come by. Aluminum networks may not be able to handle the increased loads. Superconducting materials would require prohibitive quantities of cryogenic fluid. How is our power network going to handle a load of five times its current capacity?

Heinlein treated a similar problem in his story "Waldo," which dealt with the concept of broadcast power. Studies are now under way on the development of power transmission by MASER pipeline. The distribution problem may be almost equal to the power problem.

Solutions to these engineering nightmares would certainly be rendered more rapid if the public became aware that technology is a means of maintaining life, rather than a means to destroy it.

In a very real sense, the back-to-nature bunch would return us to the days of the horse and buggy!

MICHAEL J. DUNN
2309 Utter Street
Bellingham, Washington 98225

But can you imagine 50,000,000 horses and buggies on our roads? And incidentally MHD, as of now, can only be used as an addition to standard turbo-generators, as a "Tapping" unit—not *as a replacement, while the fuel-product pollution remains unchanged.*

Dear John:

I've just finished your editorial about biological warfare, and agree in all points but one. That one merely points out that you were brought up in an age when it was "right" to vote in favor of Motherhood and against Sin and the Man-Eating Shark.

Don't you agree that if more people had been against Motherhood and in favor of the Man-Eating Shark, there would be less population crowding, less pollution, less unrest, less noise—and more time and space in which to pursue Sin, which was proclaimed "bad" only because the Establishment required some Universal Pleasure to take a firm stand against?—

GEORGE O. SMITH

You're right—except for your definition of Sin. "Sin" in any "Establishment"—which is simply another word for "culture" or "Society"—is anything that the "Establishment" sees as destructive. Thus, the hippie Establishment sees any limitation on individual whim as "Sin," and encourages unlimited freedom in the use of drugs.

Where older Establishments based on medical data consider that "cleanliness is next to Godliness," the hippie Establishment holds that dirtiness is proof of spirituality not concerned with mundane materialism.

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EDITORIAL

continued from page 7

too little protein, and what protein they get of poor quality that lacks several of the specific amino acids the human metabolism *must* have.

Some of the peoples live primarily on corn—which is one of the better vegetable sources of protein, but does lack two of the essential amino acids. A special breed of corn was developed that does supply one—but the other is still missing. But these Indians *will not* learn to raise and eat other crops that would supply the needed molecules. Anthropologists, nutritionists, and government agencies have tried—but the natives' traditional orientation remains defiantly unshakable. It's killing their children, and condemning them to irreversible brain damage—but they will *not* accept those strange, alien, and, therefore, evil foods.

Don't condemn the people too harshly—are you willing to change your diet, personally, and substitute fried earthworms and roast grasshopers for chicken and hamburgers? Earthworms are nourishing, and do contain the needed protein acids, you know. The only reason for your rejection of earthworms and toasted bugs is a purely psychological problem—

Of course, your present chicken-hamburger type diet isn't killing you and maiming your children's brains, but you can appreciate that a change of diet is mainly a psychological problem.

And because modern Psychology is still in the Alchemical stage of being a Black Art that doesn't work in the face of real-world problems—they can't crack that vital problem. Education—even the best and most patient education—doesn't do much good to protein-starved, brain-damaged children.

The problem is psychological, far more than biochemical; the biochemists stand ready with diets that would end that dreary cycle of brain-damaged children growing to stupid adults who, because of incompetence, can't advance beyond their backward level of culture.

But the psychologists have Theories and they Know The Basic Elements of Mind so thoroughly they are unable to crack the real-world problem.

I've been interested in the reactions of various Professors of Educational Psychology to the TV program "Sesame Street." As you probably know, "Sesame Street" has been one of the most brilliant successes that TV has produced in its entire history; it *is* doing for preschool children what Operation Headstart tried—and failed—to achieve. It's teaching kids from two years old up to recognize shapes, name geometric figures correctly, identify the numbers and letters, and to understand similarities and dissimilarities. The kids love it.

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But it was NOT developed by professional Educational Psychologists; it derives from techniques worked out by Madison Avenue psychologists (who were under the pressure of "to hell with your theories, doctor, we want RESULTS. Make it *work!*) and by Hollywood cartoon scenarists. Material is flashed on the screen in wild seeming confusion, with jumping, whirling, and elastically stretching and contracting letters and numbers.

A would-be instructor tries to point out the difference between "taller" and "shorter"—and the objects he's using to illustrate the terms mysteriously defy him—the tall one collapses and the short one stretches. Two adult characters keep having problems with arranging things, which they fail on woefully through egregious stupidity—while the watching children of the TV audience chortle happily and keep telling them what to do.

And in the face of the brilliant educational success this has achieved—a two-and-a-half-year old mentally retarded child who hadn't learned to count after several weeks of patient instruction by a professional teacher of the retarded, counted to ten happily after a week of watching "Sesame Street"—the professional Educational Psychologist professors are, in a number of instances, damning it as educationally destructive, mere rote learning, obviously confusing the young minds, and a very dangerous program.

Yes, it *is* very dangerous! It is striking at the very roots of Educational Psychology. Instead of driving the child to stay awake, and pay attention to the long lesson that he must learn—stretching far beyond his natural, childhood span of attention—"Sesame Street" recognizes the nature of the child and designs its method to match the real-world problem—children have a short attention span. Don't fight the nature of the real world—learn to change your methods to ones that work!

No one lesson is long enough for the child's attention span to be exceeded, and the whole little lesson is appreciated and understood. Then something entirely different comes along.

Locally, in New York City, the educational TV station on Saturday mornings, instead of running cartoons, runs five successive hours of "Sesame Street" installments. Now a child's ability to fix his attention on a *single* subject is pretty brief—but five straight hours of "Sesame Street" can hold a child's interest. Because unlike Proper Educational Methodology it keeps switching the subjects faster than the child's mind normally wanders. Each little lesson does its work—and the effect of many is cumulative. They aren't rejected, because they don't represent the painful experience of being

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forced to pay attention beyond the young mind's ability.

Look—try holding your arm out at right angles for five minutes. Painful experience about the fourth minute, isn't it? But holding your arm out for ten 30-second stretches is no real problem . . .

"Sesame Street" is dangerous to Proper Educational Psychology because it's going to deluge the schools with millions—literally!—of kindergarten children who already know everything standard kindergarten seeks to teach, and a lot more. They'll be well along into second grade subjects—without ever knowing they were being disciplined into learning things they *must* know whether they like it or not.

Psychology has, over the last three-quarters of a century, done a lousy job. Given another three-four centuries, they, too, might eventually work off the Theories and Sure Knowledge they now have and, like the alchemists, start learning what the elements in the Universe really are.

But we need answers *now*.

Fortunately, Madison Avenue and Hollywood, being forced to live in the real world of getting results, have begun to develop the rudiments of a science that passes the Schwartzberg Test. They can predict effects, to some extent in some areas at least, and that's a damn sight better than the orthodox, professional psychologists do.

It gives me no end of wry amusement to see professors of Educational Psychology damning as destructive the most brilliantly effective educational method ever demonstrated. It *must* be evil because it contraverts their theories, and, even worse, the children actually *enjoy* learning! How disastrous!

Of course one of the areas in which Psychology disastrously and repeatedly fails the Schwartzberg Test is in the matter of predicting the behavior of individuals released as "cured" from mental hospitals.

The number of homicides that result from those lousy predictions testify decisively as to the incompetence of Psychology-as-a-science. It isn't even very good as a Black Art.

And then there's the matter of Sociology. Properly, Sociology is simply the statistical division of Psychology—group-Psychology instead of individual-Psychology.

Unfortunately, bad as Psychology's score on the Schwartzberg Test is, Sociology's is even worse.

I've had sociologists complain to me that not one member of either the House or Senate had any training in Sociology.

It seems to me that, if Sociology is the science of understanding the motivations and reactions of groups of people—of how human beings behave—a sociologist should be able to get himself elected by us-

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ing his understandings of how to move groups in desired ways. The 100% failure to get even one sociologist into Congress at least suggests they aren't passing the Schwartzberg Test.

But unfortunately sociologists *have* been able to sell legislators on the wisdom of their theories as to how to improve the social conditions of people. They've convinced legislators to spend many billions of dollars to achieve needed reforms.

The results, to date, remind me strongly of the proposition of the unsuccessful witch-doctor-priest who—when the sacrifices and elaborate rituals he has prescribed to turn the wrath of the angry Gods, and bring the rain the crops must have, fail to end the drought—explains that *more* sacrifices and *greater* rituals must be carried out. The only reason the prescription didn't work, he explains, is that the sacrifices weren't great enough. His prescription is perfect—the lack of rain *is* due to the wrath of the Gods—so still greater sacrifices must be made.

The sociologists have been giving advice on how to cure the problems of the cities for several decades; many tens of billions of dollars have been sacrificed according to their prescribed rituals—and the inner cities are vastly worse off now than they were before.

Since their predictions have gone 100% wrong, like the witch-doctor-priest, they explain that the only reason for failure of their prescription was that the sacrifices weren't great enough. It should have been *hundreds* of billions—not mere tens of billions.

It's unthinkable that their prescription could be wrong, isn't it? It's perfectly obvious that the cure for poverty is to give money, isn't it?

Poverty is the result of misaligned motivations. And to date the psychologists and sociologists have demonstrated an extremely low aptitude when it comes to realigning emotions and motivations.

The true home of Psychology and Sociology is the world of Academe—and they're so ineffective in the real-world application of their supposed "sciences" that they haven't been able to do anything effective in stemming the rapid crisis—have been *rundreds* of billions—their own homes—under the attack of dissident students.

Wait a few years more and there won't be any effective centers of genuine learning left for them to pontificate from.

Ah, well . . . maybe that won't be all loss, at that. If they're booted out into the hard world of reality, they may finally start wondering if their Theories and Sure Knowledge of Basic Elements are quite so solid as they now believe.

Then they may start learning what human minds are, and how they work. The Editor

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Q. Can Freedom Shares be bought by themselves?

A. No. They must be bought in conjunction with E Bonds of the same or larger face amounts.

Q. Can I buy as many Freedom Shares as I want, as long as I buy E bonds of the same or larger amounts?

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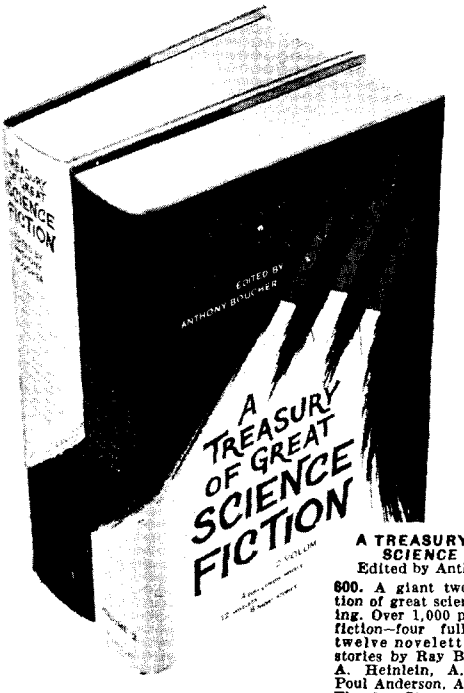

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